

THE IRON AGE

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New Carnegie Mill Equipment at Bessemer

Two Stands of 48-In. Rolls at Edgar Thomson Works Help 40-In. Blooming Mill—New No. 2 Mill for 150-Lb. Rails, Billets and Blooms

THE Carnegie Steel Company of Pittsburgh is now completing the extensive program of improvements and additions at the Edgar Thomson Steel Works at Bessemer, Pa., authorized by the United States Steel Corporation in 1912. This program contemplated the erection of a 14-furnace open-hearth plant, the relocation and improvement of the blooming mill and a new finishing mill for diversified products. The open-hearth steel plant with furnaces of a capacity of 80 to 100 tons per heat was described in the issue of THE IRON AGE of Jan. 1, 1914, that issue incidentally also containing a brief historical résumé of the Edgar Thomson works, which are located on the ground where in 1755 General Braddock fought his last fight against the French and Indians. With the return of increased demands in the steel trade, the installation of the new equipment was resumed.

The first steel rail was rolled in September, 1875, at the Edgar Thomson works, and during the forty years that have elapsed the Edgar Thomson plant has been growing steadily, and at the present time comprises eleven blast furnaces, a Bessemer department with four 15-ton converters, fourteen open-hearth furnaces, three rail mills, three foundries and a splice bar shop, briquetting plant, blooming and auxiliary mills and shops.

The new blooming mill was completed more than a year ago and was put in regular operation on Oct. 8, 1914. It has two stands of 48-in. rolls and a three-high 40-in. blooming mill. The ingots are delivered to the 48-in. rolls from the pit furnaces by means of a new design of pot car and dump. The rolls, two trains of two-high rolls, are non-revers-

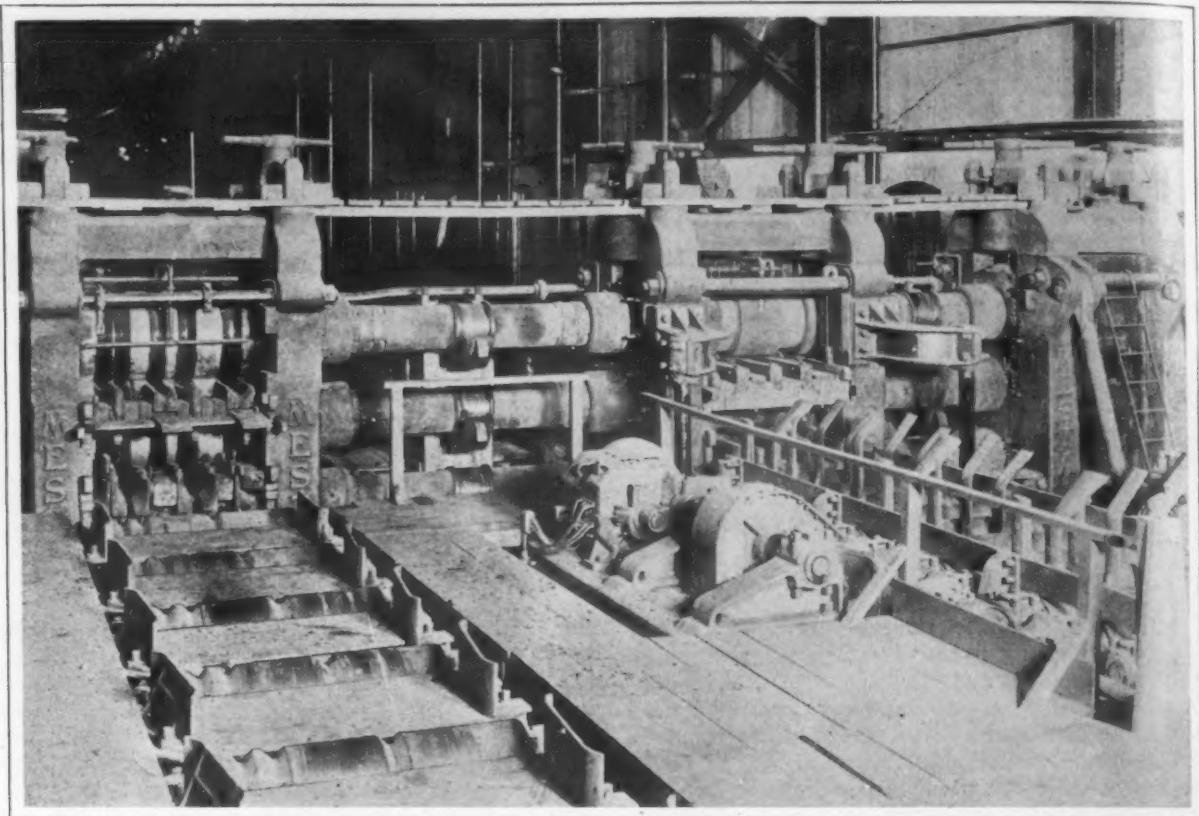
ing, and each set has two passes, the piece first going through one pass in the first stand and then through a pass in the second stand, after which it is returned to the first stand by means of two turntables and a return run, when it receives one more reduction in the first stand and a final reduction in the second stand. From the 48-in. rolls the piece goes to the 40-in. three-high mill, and is reduced to the standard size bloom, when it is sheared and delivered to the bloom transfer for distribution to the reheating furnaces or some one of the several other mills. The 48-in. rolls are driven by a 52 x 90 x 60-in. tandem-compound Allis-Chalmers engine of approximately 5000 hp. capacity and having a 150-ton flywheel. The 40-in. blooming mill is driven by a 50 and 78 x 60-in. tandem-compound Allis-Chalmers engine of 3000 hp. capacity with a 100-ton flywheel.

Among features which make the mill interesting and specially noteworthy are its commodious cellars, which provide easy access to the lifting table machinery, scale pockets and slag pits. The slag pits and tunnels under the pit heating furnaces are especially noteworthy. While at many well ordered plants conditions in similar locations about the mills are frequently far from ideal, these tunnels have, at Edgar Thomson, been made a really desirable place to work. This is in line with the vigorous campaign which has been made at the plants of the Carnegie Steel Company for the improved safety, comfort and sanitary surroundings of the employee.

As a part of the program for the development of the Edgar Thomson plant contemplated the diversi-



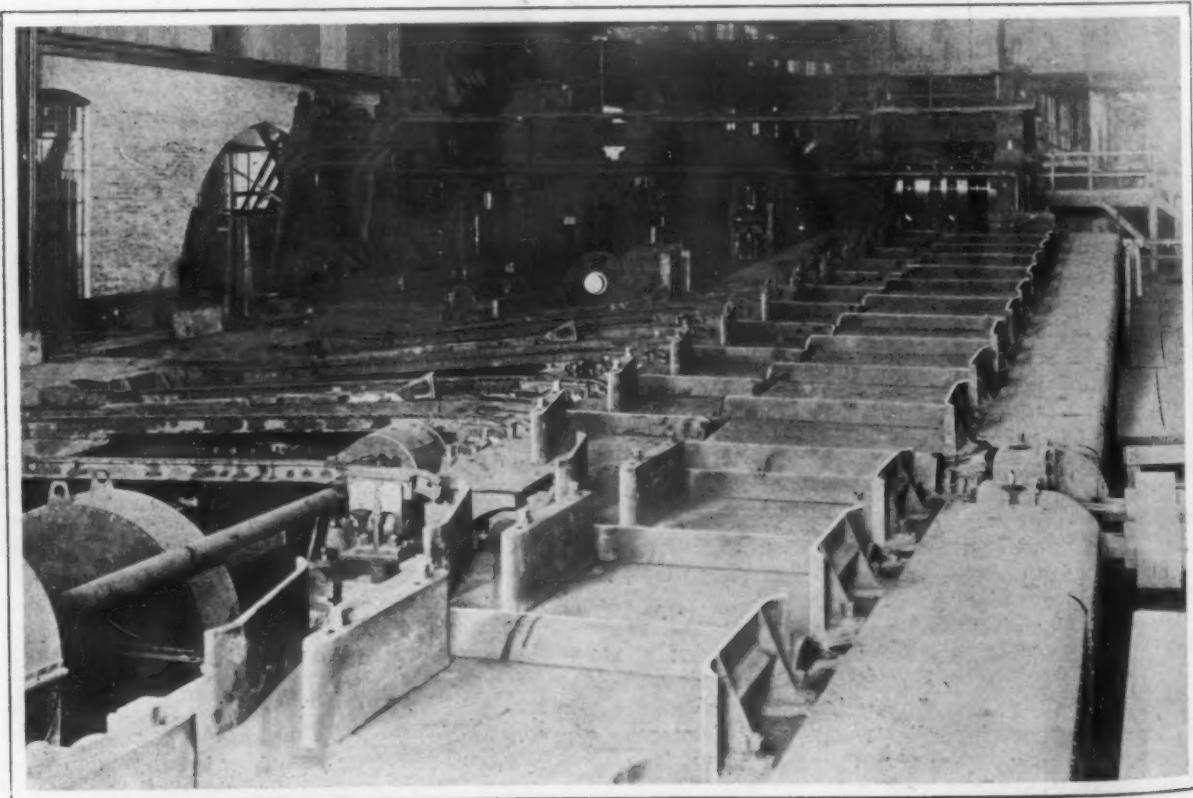
The Ingot After Being Passed Through Two 48-In. Stands Is Delivered By Means of a Turn-Table to a Return Run and then by Means of a Second Turn-Table Is Again Sent Through the Stands



First and Second Roughing Stands of New No. 2 Mill. Showing Improved Spindle Carrier Between Stands

fication of products, the new No. 2 mill was designed with this end in view, and will roll heavy rails up to 150 lb. per yard, splice bars, rod mill billets and small blooms. The mill consists of four stands of rolls set up in three trains, the first and second roughing rolls being in one train, and the first finishing in another train, while the final finishing rolls are in a third train. The three first stands are three-high, and the finishing is two-high. The roughing rolls are served by lifting tables, and the second roughing and first finishing by tilting.

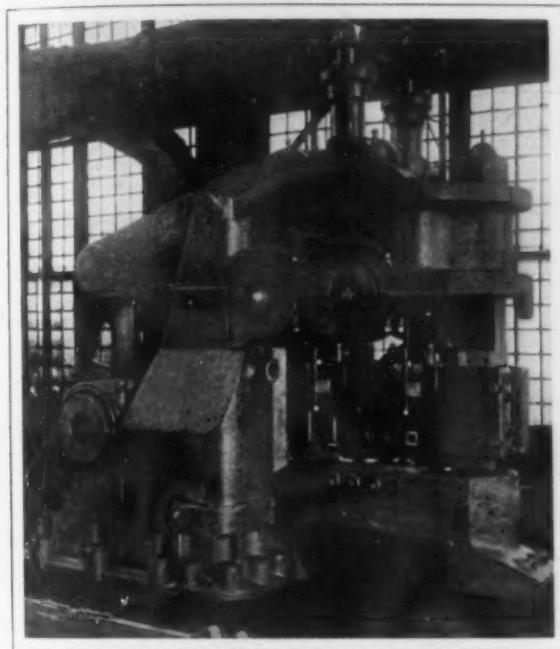
The layout is such that the rails coming from the finishing rolls will be delivered over the hot bed into the finishing department common to both Nos. 1 and 2 mills, No. 1 mill being located on the south side of the new No. 2 mill. The billets and blooms will be delivered from the shear by means of a conveyor to the loading building on the north side of the mill, where they will be distributed for inspection and loading. The billet and bloom shear is located just ahead of the rail hot bed and is of 800 tons capacity, capable of cutting six 4 x 4-in. billets



Transfer Between First and Second Roughing Stands, New No. 2 Mill

at one time, and is of a new design furnished by the William Tod Company, Youngstown, Ohio.

In the new No. 2 mill the three trains are driven by separate engines, the first and second roughing trains by a 50 x 78 x 60-in. tandem-compound Allis-Chalmers 4000-hp. 100-ton flywheel engine. The first finishing train is driven by a 50 x 78 x 60-in. tandem-compound Allis-Chalmers 4000-hp. engine with a 100-ton flywheel, while the finishing stand is driven by a 44 x 74 x 54-in. Cooper engine with 80-ton flywheel and of approximately 2000 hp. capacity. These mills were designed by the Carnegie Steel Company's engineers at the Edgar Thomson works, and most of the machinery was built in the



The 800-Ton Shear Built by the William Tod Company for the Edgar Thomson Steel Works Capable of Cutting Six 4 x 4-in. Billets at One Time

foundries and machine shops of the company at the Edgar Thomson plant. The principal exceptions to this was the 48-in. mill housings, which were furnished by Mackintosh, Hemphill & Co., and the No. 2 mill housings, which were furnished by the Mesta Machine Company, both of Pittsburgh. These two companies together supplied parts of the drive for the 48-in. rolls.

Machine for Producing Steel Wool

A machine capable of producing 80 lb. of steel wool in 10 hr. has been developed by Harry S. Williams of the Ridgely Trimmer Company, Springfield, Ohio. This machine uses bars as large as 6 in. in diameter as the material from which the wool is made and it is pointed out that the steel can be tempered to give a tougher and more uniform grade of wool than formerly. In addition to the increased output that is made possible by this machine a further decrease in the cost of production is effected by the fact that a single operator can handle four machines.

The Cleveland-Cliffs Iron Company has increased the capacity of its Lake fleet by taking over six ore boats recently purchased from other interests by J. A. Paisley of the Valley Camp Coal Company. Four other boats bought by Mr. Paisley will also be operated by the Cleveland-Cliffs Company this year and at the end of the season will be returned to Mr. Paisley. With the boats just acquired, the fleet of the company the coming season will consist of 22 ships, 18 of which it will own.

Quick-Acting Foot-Lever Machinist Vise

Fisher & Norris, Trenton, N. J., have brought out a quick-acting vise operated entirely by foot power. This vise enables both hands to be used freely in lifting and inserting work in the vise, it being emphasized that the mechanic can, in practically every case, handle heavy work by himself, which is not always the case where the work has to be tightened by hand after being placed in the vise.

The vise consists of a standard bench vise equipped with a pedal attachment which provides the movement for the jaw required to clamp the work. A push forward with the left foot on the lever pedal on that side of the standard transmits the motion to the front jaw for gripping the work. When it is desired to release the work and leave the front jaw free to travel, this is secured by pushing on the right lever with the right foot as far as it will go. In addition to this easy method of operation it is emphasized that the grip is strong.

Five sizes of machinists' vise are equipped in this way with jaws ranging from $2\frac{3}{4}$ to $6\frac{1}{2}$ in. in width and a jaw opening of from 3 to 11 in. A special vise for use by woodworkers for pieces less than $4\frac{1}{2}$ in. wide and 9 in. in length is also equipped in this way. The vise can be used with any bench, the length of the standard being varied to suit conditions.



A Vise Designed for Many Classes of Machinist's Work Equipped with a Foot Lever

Another Lock Nut

A patent covering a stamped sheet metal lock nut of simple construction has been recently granted to Day & Zimmermann, Philadelphia, Pa. The two sides of the lock nut are bent up to serve the double purpose of providing the necessary rigidity and a hold for the wrench. The lock nut is applied over the regular one employed on the bolt with the flat side against the nut. Annular extensions, dished to correspond with the pitch of the thread into which they fit, are relied upon to give the gripping action, and it is pointed out that the resistance of the dished surface to the flattening



A Lock Nut of Simple Construction Employing a Deformed Washer

stress as the lock nut is turned down results in a binding effect on the thread of the bolt and prevents the nut from becoming loose. Emphasis is also laid upon the fact that this action does not mutilate the thread of the bolt, and the nut may be used over and over again. Washers are ordinarily employed for making the lock nut, but scrap metal may be employed, thus effecting a corresponding reduction in the cost.

Improved Open-Hearth Checker Construction

The Danforth Design Increases the Output of Ingots—Special Channels Are Provided and Thin Brick Are Placed on Their Sides

A RECENT improvement in checkerwork construction for regenerative furnaces has been developed by George L. Danforth, Jr., superintendent of the open-hearth departments at the South Chicago plant of the Illinois Steel Company,

where it has been in operation on all the open-hearth furnaces for approximately the past 15 months, and, operating with a metal charge of 68 per cent iron, 24 per cent steel scrap and 8 per cent metal from iron ore, etc., has produced a tonnage never before obtained on furnaces of equal size.

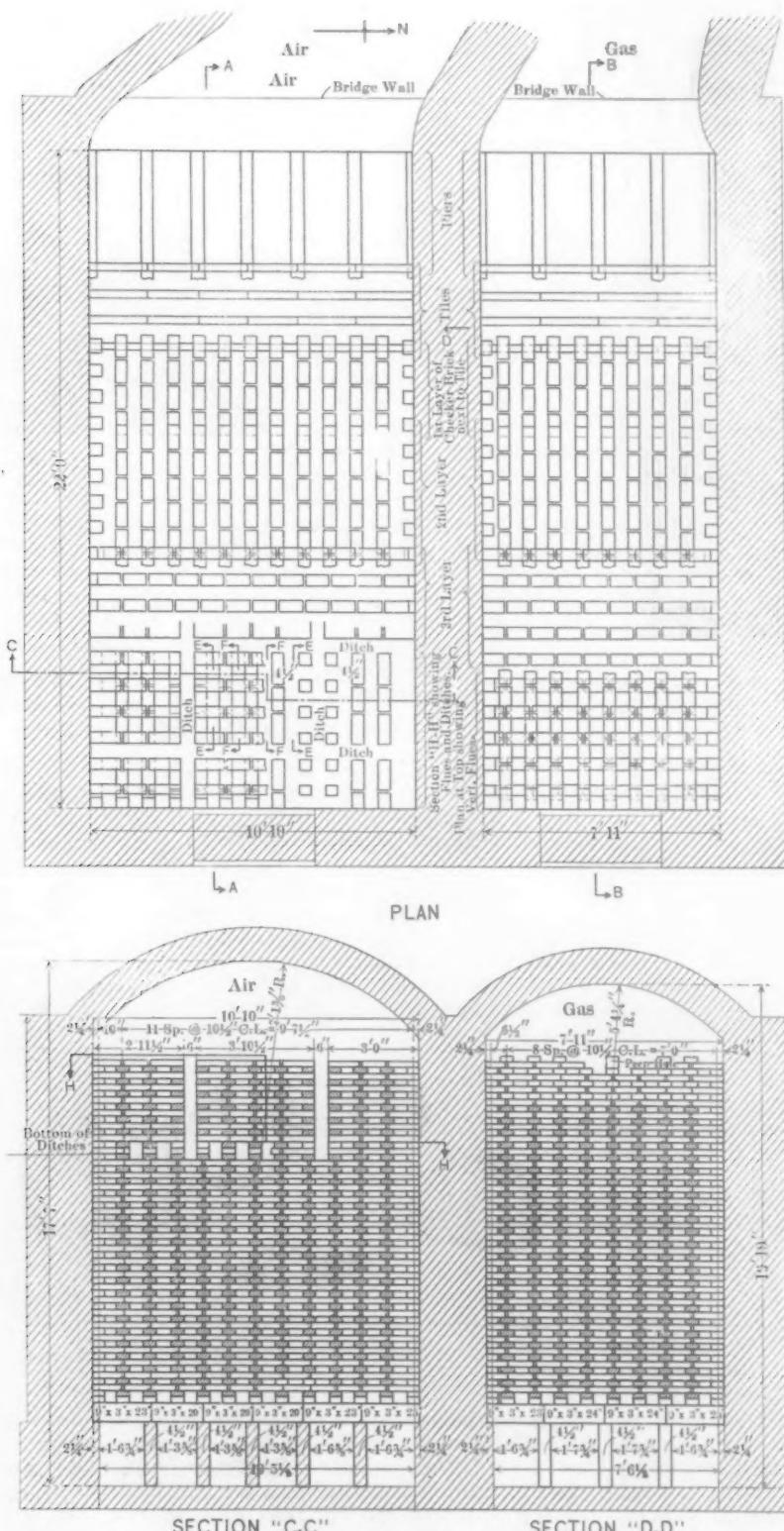
The same furnaces, having a hearth measuring inside the background on the sill line 29 ft. long and 18½ ft. wide, and rated as 50-ton furnaces, when previously operated with several different checkerworks of the ordinary type, produced an average weekly production of 907 tons, which is about 12 per cent greater than the average of furnaces of equal size and with a similar charge.

As each furnace was equipped with the improved checkerwork there was kept an accumulative record compared to a similar record for its previous campaign. With the improved checkerwork there was obtained an increased production varying on the several furnaces from 11 to 20 per cent and averaging on 14 furnaces in the latter part of 1914, with a production of 295,000 tons, a gain of 16.3 per cent in production, with approximately 10 per cent reduction in fuel and other operating expenses. This improvement has been further increased by the results of 11 months of 1915, when the weekly production of these furnaces has averaged 1128 tons, or approximately 300 tons more than furnaces of equal size and 100 tons more than furnaces having a hearth 50 per cent greater and rated as 75-ton furnaces. The table, from extensive data, compares the average productions.

The object of the Danforth checkerwork construction is to provide in the generating chambers an arrangement of the brickwork that will maintain to the highest possible efficiency the four main features that are essential for the fast and economical operation of heating or melting furnaces. These features are:

To contain in the chambers a mass or number of bricks as great as possible to afford a maximum storage capacity for the heat units to be taken from the outgoing hot waste gases, to be later transferred to the incoming air or gases.

To give the brickwork a maximum surface, exposed in such a way that the air and gases come into intimate contact with the brickwork, in order to facilitate the rapid



Cross-Section and Plan of the Danforth Checker Construction in the Regenerative Chambers of an Open-Hearth Furnace

Table of Comparative Average Production of Furnaces With and Without the Danforth Checkerwork

	Tons per 12-Hr. Turn	Tons per 12-Turn of Hearth Week	Tons per Week per Sq. Ft. Area
Normal production of 50-ton furnaces	68.2	818	2.09
Normal production of 75-ton furnaces	84.4	1,013	1.73
Fourteen (14) 50-ton furnaces at South Chicago with ordinary checkers	75.6	907	2.32
Same fourteen (14) 50-ton furnaces producing 805,000 tons after being equipped with the Danforth checkerwork.....	92.1	1,105	2.83

transfer of the heat to and from the provided storage.

To provide passageways or flues through the brickwork sufficiently large for the passage of the air and gases, yet not so large that the hot outgoing gases might pass through one part of the checkerwork and the incoming cold air or gases through another part.

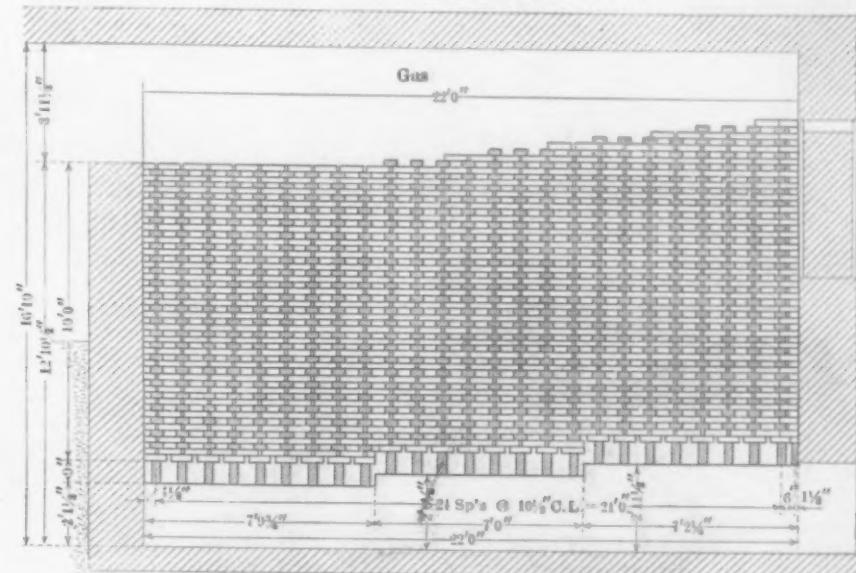
To provide a structure of the brickwork best adapted for the three foregoing features, yet so stable in construction that there will be avoided the frequent trouble of the brickwork collapsing when heated to a high temperature.

A correct combination for the first three features would not be so difficult if the passageways or flues would remain clean and retain their original area, and, also, if the relatively thin bricks necessary to provide the maximum exposed surface when laid on their edges, as is commonly done, did not present an insufficient bearing for the adjacent bricks, resulting in an unstable construction. But during the operation of heating or melting furnaces there is gathered a deposit of iron oxide and miscellaneous material upon the bricks immediately forming the passageway or flue entrances nearest to the combustion chamber, which rapidly decreases the entering area of each passageway.

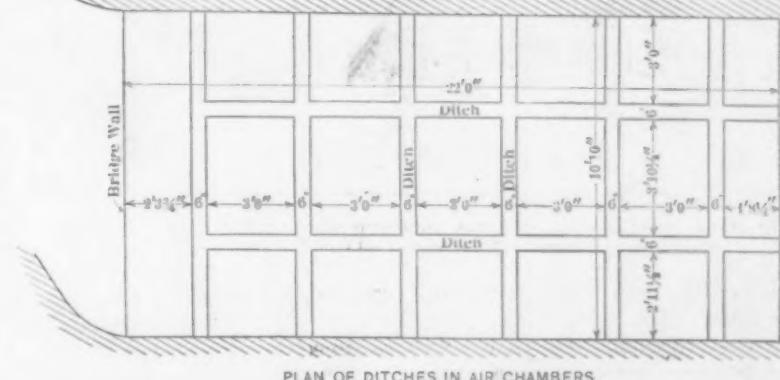
Therefore, provided there has been no sacrifice of brick mass or exposed surface, and the passageways installed with area just sufficient for the necessary passage of the gases before the deposit is made, the passageways or flues become too small locally where the deposit is made and the operation of the furnace seriously impaired by loss of draft. Otherwise, if the flues when first

installed are made large enough to avoid this later loss of furnace draft, it must be done at a sacrifice of brick mass and exposed surface, and the passageways are then too large when the furnace is first put into operation and allow the outgoing hot gases to channel and escape without coming into contact with sufficient brick mass and surface to afford proper regeneration for the incoming cold air and gases.

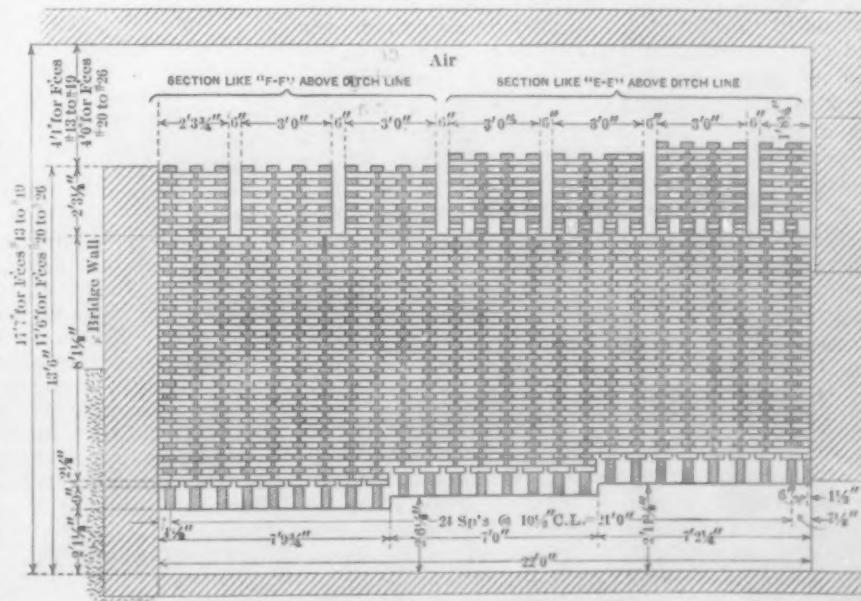
It may therefore be said that previously, in order to maintain a sufficient furnace draft, it has been



SECTION "B-B"



PLAN OF DITCHES IN AIR CHAMBERS



Cross-Sectional Longitudinal Diagrams of the Danforth Checker Construction with a Plan of the Ditches in the Air Chambers of an Open-Hearth Furnace

necessary to decrease the brick mass (heat storage capacity) and the exposed brick surface (absorbing and radiating facilities), thereby impairing the heat regeneration, which induces a slower working unit, with a decreased production, materially adding to the fuel and other operating expenses.

In the Danforth construction, as exhibited by the illustrations, there are provided in the upper part of the checkerwork channels or ditches through which the gases will to a gradually increasing extent by-pass the original or ordinary entrances that become obstructed by the deposit and enter the vertical flues by the side entrances at a lower elevation, providing additional entrances to the checkerwork. It is, therefore, possible to retain the maximum amount of brickwork with the smaller flues without sacrificing the furnace draft. By laying the bricks on their flat side instead of on edge, as in the ordinary practice, there is obtained a large base of contact with the adjacent bricks and a lower center

\$17,718.50 by a 10 per cent reduction in the conversion cost of 50,625 tons of ingots.

The two principles incorporated in this checkerwork—first, that of laying the thin bricks on their sides with adjacent ends apart to obtain the maximum exposed surface with a stable construction, and, secondly, providing in the upper part of the checkerwork enlarged passageways to by-pass the gases around the original entrances that become obstructed by the deposit, are protected by U. S. letters patent No. 1,140,125, and by patents in foreign countries. The Knox Pressed & Welded Steel Company has acquired the selling rights for this improvement.

A New 1 1/2-In. Hand Screw Machine

The E. H. Wachs Company, 141 West Grand Avenue, Chicago, Ill., has re-entered the screw machine field. The new machine, which at present is being made in the 1 1/2-in. size only, is of the same general type as that formerly built, but is a new machine. This line is planned as a permanent product of the company and it is the intention to add other sizes as soon as sufficient facilities are available. The machine, which is designed for the production of large quantities of accurate work, is equipped with a friction-gear head, positive power feed to the turret slide, independent stops, automatic chuck and wire feed and an oil pump and the necessary piping.

The headstock is of the three-step cone pulley type which provides three spindle speeds, this number being doubled by the use of back gears. The direction of the rotation of the spindle is reversed by shifting belts on the countershaft, and all of the operating levers are within easy reach of the operator from his regular position. Pieces 9 in. long can be turned and the capacity of the machine through the collet is 1 1/4 in., it being possible to pass stock of this size through the turret

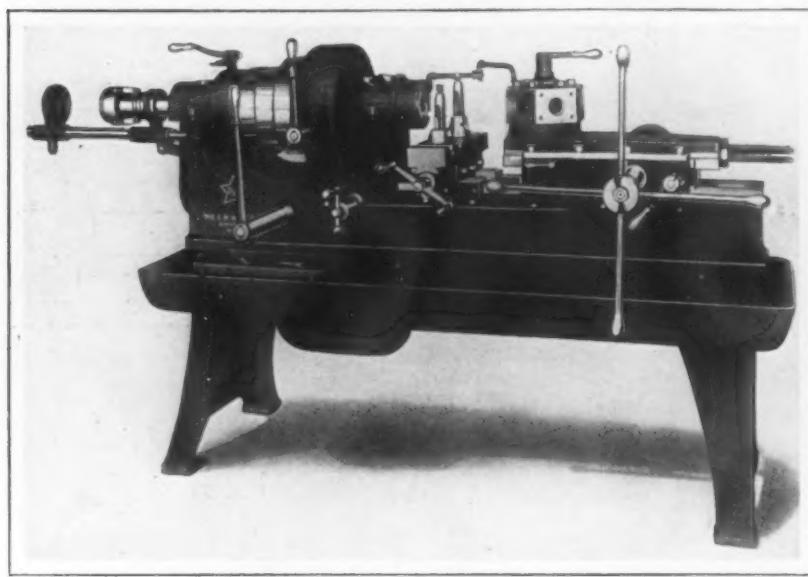
easily. The net weight of the machine complete with the countershaft is 2925 lb.

Lake Iron-Ore Analyses

Three new Lake Superior ores are listed in the 1916 analysis ore book issued by Oglebay, Norton & Co., Cleveland. These are the Eureka and Amasa Porter, both soft red hematite ores, the former from the Gogebic range and the latter from the Menominee range, and the Mahnomen from the Cuyuna range. The Ottawa, a granular red hematite from the Gogebic range, which was listed a year ago, is omitted this year.

A number of changes appear in the ores listed in the 1916 ore book issued by Pickands, Mather & Co., Cleveland. The Pattison, an old range Bessemer ore, and the Plymouth, an old range non-Bessemer ore, are both new. The Cary Empire, which appeared last year as an old range Bessemer ore, is now listed as a non-Bessemer. Three old range Bessemer ores that appeared last year are not listed in this year's analysis book—the Pewabic, the South Chandler and the Toledo. Two old range non-Bessemer ores, the Hemlock and the Michigan, are omitted this year; also two Mesaba Bessemer ores, the Minorca and Virginia Bessemer; two Mesaba non-Bessemer ores, the Euclid and the Minorca Rex, and the Calumet, a silicious ore.

An export duty of 10 per cent on tin from Australia is being proposed.



A 1 1/2-In. Hand Screw Machine Equipped with Friction Geared Head, Power Feed to Turret Slide, Independent Stops and Automatic Chuck

of gravity for each brick, resulting in a stable construction.

The cost of installing this improved checkerwork is practically the same as that of other commonly known constructions, while the cost of maintaining or renewing it is slightly greater than some and less than that of others; but inasmuch as the cost of installing, maintaining or renewing the checkerwork is approximately 1 per cent of the open-hearth ingot conversion cost, which can be increased 10 per cent with a poor working furnace, or decreased 10 per cent with a fast, hot-working furnace, the checkerwork cost of itself is immaterial.

It is claimed that with this checkerwork the average production of an open-hearth furnace can be increased at least 12 1/2 per cent, which would mean a large saving in the installation cost of furnaces necessary for any desired production, and a subsequent saving of approximately 10 per cent in the conversion cost of ingots produced.

Inasmuch as the installation cost in dollars of an open-hearth plant, with its auxiliaries, is approximately five times the annual capacity, and the average conversion cost of ingots is about \$3.50 per ton, this installation, on a furnace having with ordinary checkerwork an annual production of 45,000 tons, would produce an additional 5625 tons, which, multiplied by five, would otherwise cost \$28,125 to build, and, furthermore, would each year save

MATERIAL HANDLING MONORAIL

Savings Effected by National Supply Company in Intraplant Transportation

BY NORMAN WINCHELLO

The Toledo, Ohio, plant of the National Supply Company, manufacturer of oil and gas well machinery, has experienced a rapid growth, and with this growth has come an intricate problem in the distribution of raw material and finished product around the factory. This problem has been solved principally by an overhead monorail system, though surface tracks, both standard gage and industrial, are also in use, while ordinary overhead traveling cranes are employed in the several shops in the usual way. A layout of the plant showing the foundry, machine and assembling shops, power station, etc., and the monorail track winding its way between the buildings and reaching almost every department is presented in the accompanying line drawing.

Along the entire west side of the foundry is a row of bins suspended about 7 ft. clear of the ground. These elevated bins have a capacity of about 1400 tons and are used for sand, coke, limestone, seacoal, fireclay, etc. A monorail track runs over the row of bins and forms the means of filling them. The monorail trolleys in turn derive their supplies from gondola cars standing on the railroad track just west of the bins. This railroad track is commanded by a second monorail track, communicating with the first. Large quantities of pig iron are also unloaded by the monorail trolleys from railroad cars standing on the track, and are stacked alongside of and partly under the bins, reaching this position by portable inclined chutes. The mono-



Arrangement of Overhead Bins, Monorail System and Railroad Tracks

them from the railroad cars and dumps them into large storage bins located near the power station and gas-producer house respectively. Metal turnings are taken from a pit adjacent to the machine shops, finished parts are delivered from the machine shops to the assembly shops on the northwestern side of the plant, miscellaneous castings are handled and numerous other duties performed.

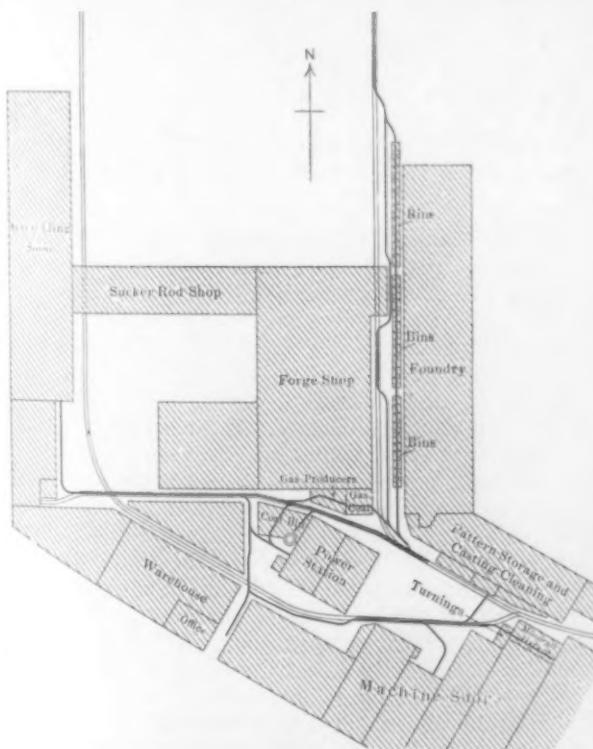
The monorail trolleys, of which there are at present two, are equipped for handling all the materials mentioned. One of them is an ordinary single hook trolley of 5 tons capacity and is equipped for operating a lifting magnet when desired. The other is a double hoist with two drums for operating a clamshell grab bucket, but arrangements are made for quickly disconnecting the ropes from the bucket and attaching them to a crosshead having a hook, so that ordinary hook work can be done as well as bucket work. This trolley, which may be seen in the halftone engraving, is also equipped for lifting magnet work.

The track comprises 2778 lin. ft. of beam and 13 track switches. The latter are of the Shaw Electric Crane Company's fixed-tongue type, which was illustrated in THE IRON AGE, Dec. 5, 1912. Briefly, the switch consists of two steel castings bolted together and is entirely without a moving part of any kind, but is nevertheless constructed so that the trolley operator in the cage can select either route through the switch at pleasure. The open end of track, familiar with other forms of monorail track switch, is wholly absent in this form, thus eliminating a danger element. In addition, the fixed tongue track switch is a time saver. Trolleys traverse it in all directions without stopping, as there is nothing about the switch to be set for the desired direction of travel and consequently no occasion to stop.

The expenditure for current is very small. A meter was installed Jan. 15, 1915, since when the current consumption for the entire system has been as follows:

	Kw.-hr.	Value
January (half month).....	800	\$12.00
February	1,746	26.19
March	2,035	30.52
April	1,623	24.34
May	1,534	22.01

The monorail system has effected large savings, since it went into operation. The National Supply



Layout of the Plant Showing the Arrangement of the Monorail Tracks

rail trolley is thus enabled to remain on the more westerly of the two monorail tracks, although delivering material almost under the parallel track.

Both steam coal and gas coal in large amounts are handled by the monorail system, which unloads

Company keeps a careful record of its handling costs and the accompanying figures, relating to coal handling, are typical:

Unloading Steam Coal		With	
	Without	Monorail,	Monorail,
	10 mo.	6 mo.	
Total weight, lb.	11,349,140	8,094,189	
Total labor cost	\$1,071.32	\$132.72	
Average labor cost per ton...	\$0.1888	\$0.0328	

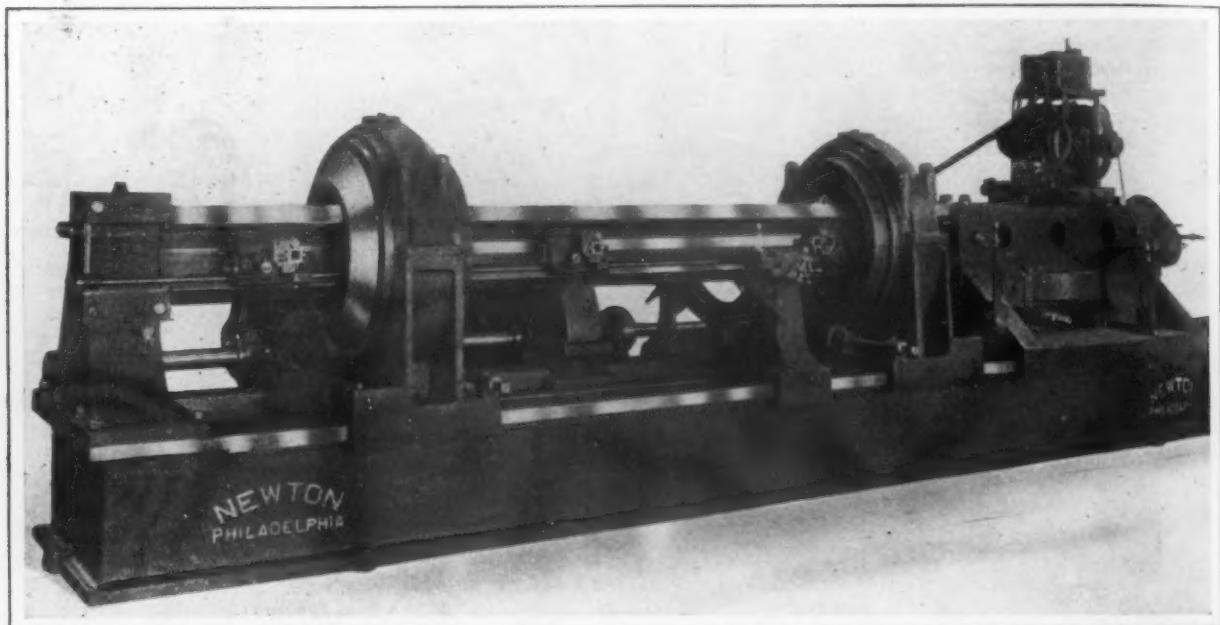
Unloading Gas Coal		
Total weight, lb.	8,725,200	2,383,400
Total labor cost	\$1,335.45	\$89.31
Average labor cost per ton...	\$0.3062	\$0.075

Large as are the savings in coal handling reflected by the table presented, they do not represent the entire saving effected even in the coal handling alone, as the scarcity of suitable labor had previously rendered it necessary to maintain constantly on the payrolls a sufficient gang of men to deal adequately with the coal as it arrived, even though there were slack times between. The yard gang

Machine for Boring Torpedo Flasks

Application for a patent has been made by the Newton Machine Tool Works, Inc., Philadelphia, Pa., covering a machine for the finished boring of torpedo flasks. It was invented and designed by the Development Board maintained by this firm, and is claimed to be capable of turning out work in one-quarter of the time formerly required. The interesting points about the new machine aside from this decrease in the time of production, are the use of a special type of chuck jaw, the employment of a stationary boring bar equipped with two tool heads and the adjustment provided for the insertion of the flask.

The outside of the flask is gripped in two revolving chucks which are rotated in unison by power received from a common shaft through worm wheels. When the flasks are inserted in the machine one head is moved away from the stationary head



Machine for Finishing the Interior of Torpedo Flasks by Boring Equipped with Formers to Insure Accurate Duplication of Contour

alone has been reduced from 16 to 3 since the installation of the monorail system. The total labor saving is estimated by the National Supply Company as certain to amount to at least 30 men, when the structural alterations now in progress in the plant are completed and normal business conditions resumed.

Accident Compensation in Maryland

The first annual report of the Maryland State Industrial Accident Commission, which has been in existence since Nov. 1, 1914, shows that in the year ended Oct. 31, 20,348 accidents were reported, 121 fatal. Claims were filed in 3443 cases, 91 of which were fatal. Compensation was allowed in 2977 cases, refused in 199, and 267 cases are pending in the courts; 249 cases were contested. The report shows that 20½ per cent of the non-fatal accidents were in the iron and steel industry, but only 13.7 per cent of the claims for compensation came from this industry.

Commencing in March the Northern Iron Company's furnace at Port Henry, N. Y., will start a run of a few months producing special Bessemer pig iron, in which the phosphorus will vary, according to specifications, between 0.03 and 0.05 per cent. Pilling & Crane, Philadelphia, are sales agents.

to give a distance slightly greater than the length of the flask. The flask is then moved horizontally through the chuck on the stationary head and the movable one adjusted over the flask until the desired position is reached. The chuck jaws are made of a special type which is relied upon to prevent the crushing of the flask, which might possibly occur if an ordinary chuck of the narrow jaw type were used.

The boring bar, which is attached to the main head, is stationary and has tool heads on each side designed to pass each other without interference. Each of these heads has power feed along the bar. Automatic release is provided for the feed together with an adjustment for the heads at right angles to the axis of the bar, this latter movement being controlled by formers that have an outline corresponding to the desired interior contour of the flask. The motor for driving the machine is mounted on the main head, which has reversing fast power traverse on the base to enable the boring bar to be inserted or withdrawn after the flasks are located in the revolving chucks.

The weight of the machine is in excess of 70,000 lb. and the floor space occupied measures 8 x 40 ft.

The American Steel Foundries, Chicago, Ill., has added a 6-ton Heroult electric furnace at its plant at Indiana Harbor, Ind.

Features of Welfare Work at Duquesne, Pa.

How the Carnegie Steel Company Has Provided for Children's Playgrounds, Gardens, an Ap-



prentice
School, and
Classes for
Foreigners

THE Carnegie Steel Company has instituted at various plants activities looking to improvement in the physical condition and home life of its employees. This work is further advanced at Duquesne than elsewhere and the several illustrations reproduced here represent what is being done at that works. One of the main objects in undertaking this work was to make better men, women, boys and girls in the families represented by Carnegie Steel Company workmen and also to raise the standard of living of the employees.

Among the activities connected with this work there have been established playgrounds for the children, children's and employees' gardens, a city-beautiful contest, an apprentice school, an English school for foreigners, and a visiting nurse.

CHILDREN'S PLAYGROUNDS

The playgrounds at the Duquesne Works were established in June, 1913. Two play centers were located in Duquesne, one of them being in the foreign section of the town. One of these playgrounds

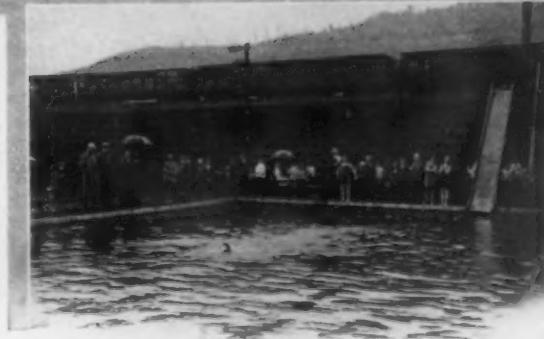
playground. They are equipped with various devices including swings, see-saws, slides, flying rings, climbing poles, horizontal bars, etc., all of which add to their value. In addition there has been constructed at the Water Street ground, in the foreign section of Duquesne, a swimming pool and a wading pool. The swimming pool is 60 x 35 ft., 3 ft. 9 in. deep at one end and 6 ft. 8½ in. deep at the other. During the three months that the playground was open in 1914 there was a total attendance at the swimming pool of 12,588, or an average of 179 per day. During this period 34 boys and 74 girls learned to swim. The attendance during 1915 was lower, due to the unusually cold weather which prevailed during the summer months, but notwithstanding 23 boys and 13 girls learned to swim.

In addition to their use as playgrounds the grounds are used for educational and entertainment purposes by means of moving pictures which are exhibited three nights a week at each of the two company playgrounds in Duquesne. Four reels are shown each night, two of which cover welfare

THE PLAYGROUNDS AT DUQUESNE, PA.



was purchased in 1914 by the borough of Duquesne but it is still operated by the steel company in connection with those maintained by it. The playgrounds are in charge of paid instructors, there being one superintendent and two assistants at each



or sociology pictures, the other two reels being comedies. The titles of some of the educational films which have been shown are "Safety First," "Transformation of a Bale of Wood," "Manufacture of Silk," "Farming with Dynamite," "Fruit Growing

Along the Columbia River." Other films which have been shown with a view to educating the people in regard to their own country are views of the Yellowstone and Glacier National parks and other localities in the United States.

In connection with the playgrounds summer schools are conducted in which are taught wood carving, raphia work, carpentry, sewing, folk dances, etc. The summer schools and a portion of the work on the playground are taken care of by young ladies of the town who volunteer their services. An idea of the extent to which the playgrounds are used may be gathered from the following summary of the annual report covering this activity for 1915: Total attendance during the

means of fairs, at which time prizes are awarded for the best vegetable products of the particular kind exhibited.

In addition to the children's gardens there are eight community demonstration gardens located in different parts of the town. These gardens, although under the direct supervision of the garden teacher, are cared for by volunteers living in the vicinity. A \$1 prize is also given for the best vegetable exhibit from these community gardens.

Flower days also form a feature of the garden work, there being several of these days held during the year. Flowers are collected from the homes of the citizens of the town and after being assembled and exhibited are distributed among the sick and



The Best Flower Garden
The Children's Gardens

The Best Porch Box
The Prize Vegetable Garden

SOME RESULTS OF THE GARDEN AND CITY BEAUTIFUL CONTESTS

three summer months, 131,117; average per month, 43,706; average per day, 655; average attendance per day at the moving picture performances, 2082; average daily attendance at the summer schools, 194; total number of volunteer workers in the summer school, 44.

CHILDREN'S GARDENS

One of the accompanying illustrations shows a series of children's gardens, the first of which was started in the spring of 1914 under the supervision of a paid garden teacher, who was assisted by volunteers from the town. In 1915 there were 168 individual gardens, approximately $7\frac{1}{2} \times 10$ ft. each. Each garden is under the entire care and maintenance of one child. The product of the gardens is exhibited at different times throughout the year by

shut-ins of the town and to the hospitals of Duquesne and the vicinity.

The gardens have proved popular among the children. The average daily attendance during the three summer months of 1915 was in the neighborhood of 60.

CITY BEAUTIFUL CONTEST

In an effort to improve the standard of living and to improve the appearance of the homes of the employees, a city beautiful contest was instituted in 1913. This contest was open to all employees of the Duquesne works living in the town. That this contest has proved well worth while is attested by the illustrations herewith, showing those homes which received first prizes for flower growing and garden activity. During 1915 about

125 employees entered the contest and prizes were given as follows: Best general appearance, \$75; best lawn, \$50; second best lawn, \$25; best flower garden, \$50; second best flower garden, \$25; best vegetable garden, \$50; second best vegetable garden, \$25, five best porch boxes, \$10 each.

APPRENTICE SCHOOL

An apprentice school was started Sept. 1, 1913, at Duquesne in which are taught mechanical drawing and higher mathematics. Every apprentice in the machine, boiler, roll and carpenter shops, as well as in the electrical department, is required to attend the school at least two hours two days every week. School sessions are held every morning from

advanced in accordance with their progress in their work.

A nurse to conduct welfare work among the poor and sick of the town, both employees and non-employees, was first employed in August, 1913. Since that time a nurse has been continuously engaged in this work and averages between 150 and 175 visits per month. Her work not only includes medical attention and suggestions for physical betterment in the homes, but also the disposition of charity and the finding of work for the boys and girls of the family in order to make them self-supporting.

A Little Mothers' Club has been organized, sessions being held two days each week under the



The Class in Sewing
The Class in Basket Work



The Beet and Carrot Fair
The Class in Woodcarving

HELPING THE CHILDREN AT DUQUESNE

seven to nine and on Monday and Tuesday evenings each week from 5.30 to 7.30. Two teachers are employed in the school, the attendance at which averages about 60.

VISITING NURSE

In addition there was established at the same time as the apprentice school a school for teaching English to foreigners. Sessions are held three nights a week with an average attendance of about 50.

While the school was begun principally for the purpose of teaching the English language to foreign workmen it has developed to a point where at present the men are doing what will correspond to fourth grade work in the public schools. The men are divided into four classes and are regularly

direction of the nurse. One class consists of the smaller girls, while the other comprises children of more advanced age. The average attendance at these classes ranges from 25 to 40. Sewing and other domestic arts and the proper care of the baby are taught at these sessions. Other activities instituted by the nurse are a chapter of the Camp Fire Girls and household center work. This latter comprises the teaching of cooking and good housekeeping, regular sessions being held in the afternoon.

A community Christmas tree furnishes another instance of the many things that are being done to improve the conditions in Duquesne. On Christmas eve the tree is lighted and an entertainment is furnished by a brass band and choirs organized from the American, German and Hungarian socie-

ties in the town. At the close of the entertainment there is distributed to the children about 2000 one-pound boxes of candy, 2000 popcorn balls and ten barrels of apples.

While the work at Duquesne is further advanced than at the other plants of the company, the following report showing the average daily attendance at the playgrounds at the other works indicates that the facilities at Duquesne are not appreciated more highly than they are at the other plants:

ATTENDANCE AT PLAYGROUNDS, 1915

Works	Average Daily Attendance
Mingo Works	350
Ohio Works	832
Homestead Works	1,266
U. & L. Mills, Youngstown	937
Isabella, Lucy, Neville and Edith	250
New Castle	1,197
Duquesne	1,496
Total	6,328
Average at each playground	904

The welfare work of the Carnegie Steel Company is combined with that of the Safety First Department, the two being under the direct charge of L. H. Burnett and a corps of able assistants. The results obtained from the money, time and effort expended by the company to better the living conditions of its employees and their families has been fully justified. Regular sessions of the Safety and Welfare departments are held in the general offices of the company in the Carnegie Building, Pittsburgh, and any suggestions coming from an employee or from any other source, looking to the advancement of safety and welfare work among its employees are welcomed. The company intends to prosecute its safety and welfare work as vigorously as possible, believing that even better things are bound to come, and that the object of making better men and women and boys and girls is going to be more than realized.

Wrought Steel Pulley for Heavy Service

The Medart Patent Pulley Company, St. Louis, Mo., has placed on the market a line of wrought steel pulleys for heavy duty. They are made with either single or double arms, and the latter, which is the one illustrated, is made in both the split and one-piece type.

In the construction of this pulley, which is called the Hercules, flat wrought steel is used for the arms, while the hubs and rim lugs are of semi-steel. The outer faces of the lugs are ground to conform to the inner circumference of the pulley and are fastened in place by rivets driven by pneumatic hammers. In this way, it is pointed out, shrinkage strains are eliminated.

The pulleys are made for any diameter between 3 and 15 ft., and a face width not exceeding 50 in. While the dimensions of the arm, hub and lugs and the thickness of the rim are standardized for each size of pulley, it is possible to vary these if the conditions of any particular installation should make this necessary.

Wrought Steel Pulley of the Double-Arm Type Designed for Heavy Duty Service

A Pit Type of Pattern Drawing Machine

The Mumford Molding Machine Company, 2059 Elston Avenue, Chicago, Ill., has developed a type of pattern drawing machine for which the advantages of increased output and a marked reduction in the amount of skilled labor required are claimed. This machine is



A Pattern Drawing Machine Designed for Installation in the Pit and on the Same Foundation with a Jolt Ramming Molding Machine

independent of the jolt ramming machines now in use and if desired can be installed in the pit on the same foundation that is employed for the molding machines.

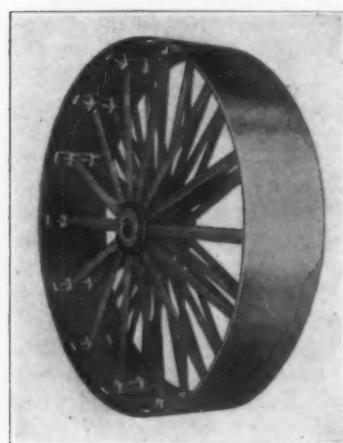
Six of these machines are installed in the foundry of the King Sewing Machine Company, Buffalo, N. Y., which was illustrated in THE IRON AGE, Jan. 6, 1916, in conjunction with the same number of jolt ramming machines. With the use of this combination two men and one core setter put up 155 molds of a cream separator body weighing 59 lb. and requiring the setting of four cores in a day. The output of the combination when working on a cream separator base casting having only one core and weighing 56 lb. was 130 molds per day for four men and one core setter. When a roll-over machine was used on this class of work the daily output was only 45 molds per day.

Pension System Information

The National Civic Federation, Metropolitan Tower, New York City, has published a book which will be found of value to those who are interested in pension or retirement systems. It gives a summary of the present status of pensions for Federal and State employees, with data relating to pensions for municipal employees, accompanied by a list indicating the various types paid in 200 of the leading cities in this country. The book also presents in tabular form information regarding 55 industrial pension or retirement systems now in operation, with membership plans, amounts of annuities, age of retirement, etc. The price of the book is \$2 per copy, with a discount on ten or more copies.

The State Industrial Board of Pennsylvania announces that hereafter inspections of boilers and elevators made by inspectors employed by casualty insurance companies who have passed State examinations will be accepted by the State. To further prevent duplication of inspections the State Insurance Board has appointed R. M. Pennock of the Department of Labor and Industry safety engineer for the insurance board also.

Canadian steel companies are taking measures to insure an adequate supply of iron ore for the coming year. The shipments of iron ore from Wabana, Newfoundland, were 600,000 tons for 1915 against 320,000 tons in 1914. None of the 1915 shipments went to the United States.



A Research on Heat Transmission

A paper giving the results of a research on heat transmission by C. H. Landen, carried on at the Manchester (England) University, was read recently by Prof. J. E. Petavel before the Manchester Association of Engineers. The object of the research was to determine experimentally the heat flow under certain definite conditions and to estimate the relative importance of radiation, conduction and convection. Conclusions drawn from the research were:

1. Conduction is important when the diameter of the hot body is small or the pressure of the air low.
2. Convection becomes the main factor when the air pressure is high or the diameter large.
3. The loss is principally due to radiation at very high temperatures and very low pressures.

To determine the rate of transmission to air at atmospheric pressure, tests were made with steam in ordinary steam piping, of $\frac{1}{4}$ in., $\frac{3}{8}$ in., 1 in., 2 in., and 6 in. diameter, and with sheet metal pipes 3 in., 5 in., and 12 in. diameter. The steam pressures ranged from atmospheric to 200 lb. per sq. in. In addition, tests were made with hot-water tanks, one of which had a capacity of 14,000 gal. The heat loss, in the steam experiments, was calculated from the condensed steam collected per minute, after corrections had been made for losses in the connecting piping. The author compiled

minimum of 5.45 B.t.u. with a density of covering material of 10 lb. per cubic foot from which point it rises to 6 B.t.u. at a density of covering of 15 lb. per cubic foot. Commenting on this diagram, the author stated that all solid materials used as insulators were better heat conductors than air, and the use of an insulating material really increased the loss due to conduction. This is important in the case of a wire or a small pipe, where the conduction loss is more important than that due to radiation. The insulating effect of any solid material is improved by so disposing it that the least quantity of material will subdivide the space around the pipe into as many air cells as possible.

An important feature of the paper was the information given with regard to experiments carried out in air at pressures up to 2500 lb. per square inch. As the pressure rises from atmospheric to 150 atmospheres the loss per degree increases to nine times its original value. This is for a temperature difference of 152 deg.; at high temperatures—2000 deg. Fahr.—radiation forms a large proportion of the total loss, and hence the increase is relatively less—five times. At all pressures the heat loss is very large for small diameters. It decreases rapidly as the diameter increases up to $\frac{1}{2}$ in., and becomes relatively constant for diameters above 3 in.

From what has been said above it follows that for a small wire at high temperatures and pressures the conditions combine to produce a large heat loss. The loss reaches a maximum when high temperatures and pressures are combined with rapid motion of the gas.

In Table II the loss due to each of the three factors—convection, conduction and radiation—is given as a percentage of the total. The loss by radiation and conduction is calculated from the usually accepted constants, the loss by convection being obtained by difference.

By-Product Coke Project at Buffalo

A charter of incorporation has been granted to the Union By-Product Coke Company, Buffalo, N. Y., with a capital stock of \$1,000,000. Francis J. Lewis, Davenport, Iowa, is to be president of the company; Robert Roberts and Marvin W. Roberts, Evanston, Ill., and Frank B. Baird, president Buffalo Union Furnace Company, are directors. Negotiations are in progress for a site of 21 acres on the Buffalo River and the Erie Railroad, immediately adjoining the plant of the Buffalo Union Furnace Company, and if the contemplated arrangements are effected the coke produced will be

TABLE I.
Heat Loss per Hr. in B.t.u. per Sq. Ft. per Deg. Fahr. Temperature Difference

External Diameter of Radiator, In.	At Atmos. Press (212 Deg. Fahr.)		Steam at 100 Lb. (338 Deg. Fahr.)		Steam at 200 Lb. (388 Deg. Fahr.)		Superheated Steam at 500 Deg. Fahr. (440)	
	Temp. Diff. 152	Temp. Diff. 278	Temp. Diff. 328	Temp. Diff. 440	Temp. Diff. 152	Temp. Diff. 278	Temp. Diff. 328	Temp. Diff. 440
0.20	3.94	5.40	5.75	6.00				
0.50	3.35	4.26	4.50	4.88				
1.00	2.92	3.72	3.93	4.30				
2.00	2.59	3.37	3.58	3.92				
3.00	2.50	3.30	3.48	3.80				
6.00	2.36	3.18	3.35	3.70				
12.00	2.35	3.14	3.32	3.66				

Table I, giving values of the heat loss from metal surfaces, such as bare steam pipes of various diameters under different temperature conditions. The results point to the fact that the heat loss from steam-heated surfaces is due mainly to convection.

The figures refer to an oxidized surface such as that of the ordinary unpainted steam piping. Careful polishing would diminish the amount lost by radiation to

Table II—Approximate Percentage of Heat Loss Due to Radiation, Conduction, Convection

Temperature difference, Fahr.	Cyl. at low temp. in air at atmos. pressure		Bright cyl. at low temp. in air at atmos. pressure		Small dark wire at low temp. in air at atmos. pressure		Small bright wire at low temp. in air at atmos. pressure		Bright cyl. at high temp. in air at atmos. pressure		Small bright cyl. at high temp. in air at atmos. pressure		Bright cyl. at low temp. in air at high pressure		Small bright cyl. at low temp. in air at high pressure		Small cyl. at high temp. in air at high pressure		Small cyl. at low temp. in air at low pressure		Small cyl. at high temp. in air at low pressure		
	Diameter, inches	Pressure of air, lb. per sq. in.	1	1	.04	1	.04	1	.04	1	.04	1	.04	1	.04	1	.04	1	.04	1	.04	1	.04
152	152	14.7	152	14.7	.04	152	14.7	1500	1300	152	152	1300	180	152	152	2120	2120	2120	2120	14.7	14.7	1200	1200
Radiation	15	3.5	15	4		34	16	0.9	0.4	2.5	7												
Conduction	4	4.5	43	49		4.5	50	0.5	0.6	8.0	82												
Convection	81	92	42	47		61.5	34	98.6	95.6	89.1	11												

one-quarter, while machining the pipe to an ordinary finish would halve the radiation.

In discussing the effect of insulating materials on the heat loss caused by convection currents, the author presented a curve showing the effect of different densities of the insulating medium. According to this curve, the heat loss is at a maximum of 7 B.t.u. per hour per degree of temperature difference, with a density of the covering material of 5 lb. per cubic foot. It is at the

used by that company. The charter of the coke company provides that it may engage in general mining, building furnaces, forges and foundries and dealing in metals in all forms, as well as in the production of coke and its by-products.

A scrap dealer at Lafayette, Ind., who had been accumulating stock for six years, sold the whole of it to a large munition manufacturer.

PROFITS FROM THE DRY BLAST

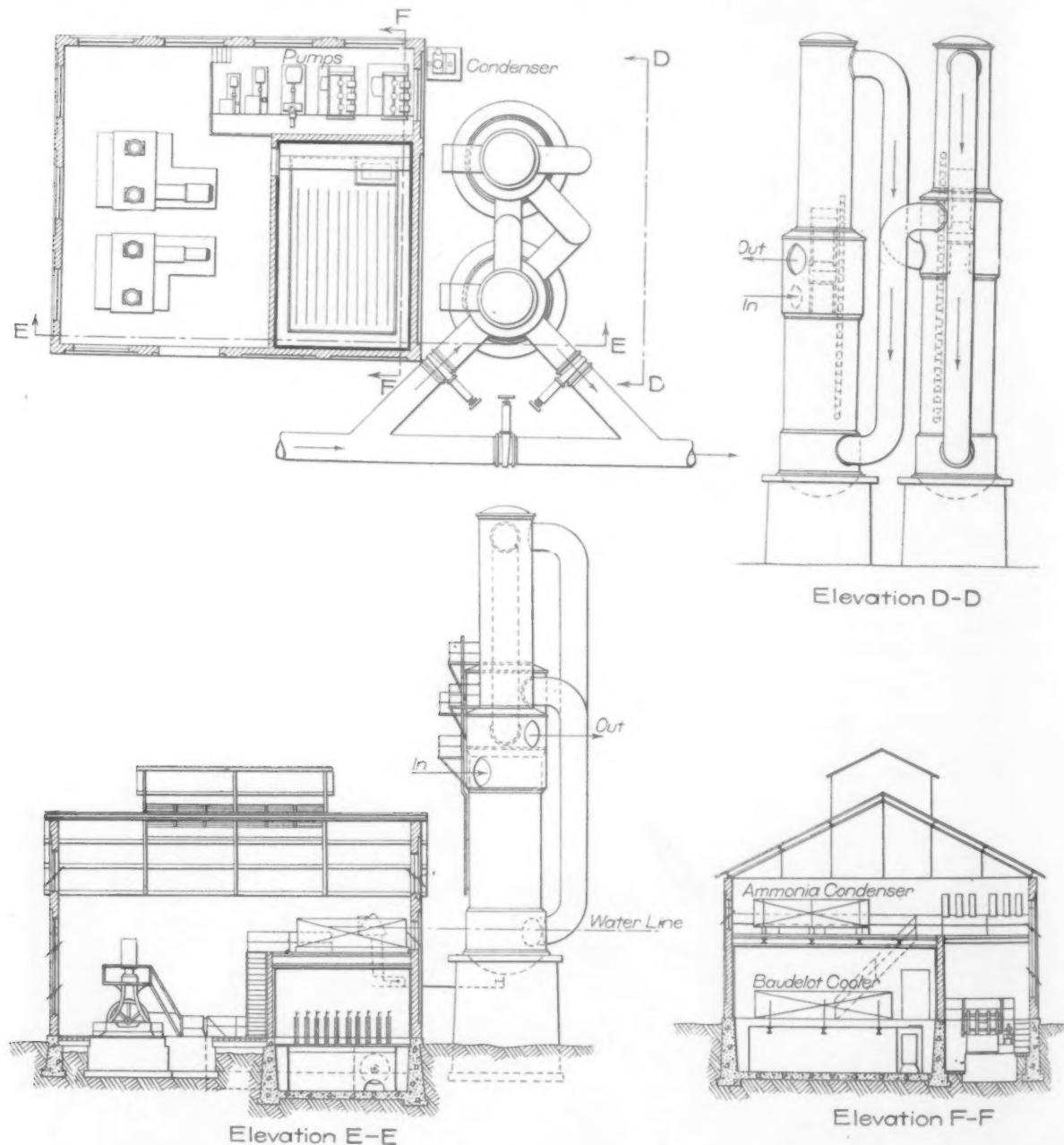
Figures in the Light of Apparatus for Cooling the Air After Compression

The condition of prosperity existing in the iron trade to-day should, in the opinion of John B. Miles, consulting civil engineer, Ardmore, Pa., lead to the installation of Gayley dry-blast plants at many furnaces where the need has been realized but where, hitherto, on account of unfavorable market conditions, the expenditure involved could not be made. The accompanying tabular calculation of the increased profits due to use of the dry blast has been obtained from him. In this connection he recalls

original claim (an increase in output of 10 per cent and the fuel per ton of iron reduced 10 per cent) has been borne out by later experience with plants using dry blast.

"I am aware," Mr. MacCoun continued, "that there have been instances in which the results from these plants have been disappointing, as much greater savings were expected than Mr. Gayley originally claimed; but in a matter of this kind, the results in one particular case should not be considered but rather the average results of all installations accepted as decisive, and I know that, on the average, Mr. Gayley's claim has been fully borne out."

Without any material increase in fuel consumption, Mr. Miles holds that the production can be in-



Plans and Elevations of Plant for Dehydrating 40,000 Cu. Ft. of Air per Minute

the statement of A. E. MacCoun, superintendent of the Edgar Thomson Furnaces of the Carnegie Steel Company, in his paper read before the American Iron and Steel Institute. The Gayley dry-blast process, said he, "helps greatly to more uniform and successful blast-furnace practice, as in addition to producing uniform moisture content in the air blast, it gives the furnace a uniform supply of oxygen by weight, and I am satisfied that Mr. Gayley's

increased 15 per cent, and he emphasizes that increase of product can be secured by a less investment in plant through dry blast than by installing additional furnace capacity, since a dry-blast plant costs less than 10 per cent of the cost of a blast furnace and its accessories. The other advantages claimed for dry blast—reduced fuel when desired, regularity of grade, etc.—he regards as thrown in as a gift.

The table of "Increased Profits" is based upon conditions existing in eastern Pennsylvania. For other coke prices, for example, the reader may make his own estimate of savings to suit his situation. Such a return as that shown, from dry blast, is equivalent to a fair dividend on the stock of the furnace company. The cost of the dry-blast plant and license fees appearing in the statement is based

Increased Profits Due to Use of Dry Blast

Natural Air Data—Assumed.

Blast per minute	40,000 cu. ft.
Yearly product	145,000 tons
Coke, per ton of iron	2,300 lb.
Costs per ton of iron:	
Coke at \$4 per 2000 lb.	\$4.60
Cost above materials, exclusive of costs varying with tonnage	\$1.10
Costs varying with tonnage	0.15
Total cost above materials	\$1.25
Profit per ton of iron	\$2.00

Dry Blast Data—Assumed.

Decrease in fuel consumption	10 per cent
Increased product	10 per cent
Yearly product 145,000 × 110 per cent	159,500 tons
Savings per ton of iron will be as follows:	
On coke—10 per cent of \$4.60	\$0.46
On cost above materials	
\$1.10 — (\$1.10 ÷ 110 per cent) = \$1.10 —	
\$1.00	0.10

Total saving per ton	\$0.56
Saving per year, 159,500 tons at \$0.56	\$89,320
Profit on increased product, 14,500 tons at	
\$2	29,000
Total yearly saving and profit on extra product	\$118,320
Less—	
Operating expense, dry-blast plant, 159,500 tons at \$0.04	\$6,380
Depreciation on cost of plant, 5 per cent of \$71,000	3,550
Increased profits	9,930
Return on investment, \$108,390 ÷ \$71,000	152 per cent
Increased profit per ton of iron, referred to original production, \$108,390 ÷ 145,000	\$0.75

upon the use of a process for drying air patented by Mr. Miles, the apparatus for which costs, he says, very much less than the type generally in use. The cooling is done after the air is compressed in the blowing engines, and sprays of water are used in direct contact with the air, the entrained water being removed by means of eliminators.

The accompanying drawings cover the design of a plant to treat 40,000 cu. ft. of air per minute, cooling water from a natural source being used in the first stage, the moisture to be reduced to 1½ grains per cubic foot. It is assumed that the outside air is at 90 deg., contains 9 grains of moisture per cubic foot, and that the blast pressure is 15 lb. per square inch. These are summer conditions. During the remainder of the year, the moisture can be reduced below 1½ grains per cubic foot and the power requirements also much reduced. Frequently, during the winter months, the cooling water, it is found, so nearly approaches the freezing point that it can be used in the second stage without artificial refrigeration.

A valve is inserted in the cold-blast main, and the air taken from the main between this valve and the blowing engines passes through the cooling towers and interchangers into the main again at a point between the cut-off valve and the stoves. In the case assumed, the air at 222 deg. passes through the first interchanger, where it is cooled by air from the second interchanger, thence flowing upward through the first-stage cooling tower, where it comes in contact with fine sprays of 75-deg. cooling water

and is reduced to a temperature of 80 deg. Leaving the first-stage cooling tower the air passes to the second interchanger, where it is cooled by air from the second-stage cooling tower, and passes upward through this tower, meeting artificially cooled water at 38 deg., which cools it to 42 deg., at which temperature and at a pressure of 15 lb. per square inch, it contains the equivalent of 1½ grains per cubic foot of free air. The air, leaving the top of the second-stage cooling tower, passes to the bottom of the second interchanger, out at the top, then to bottom of the first interchanger, out at the top to the cold-blast main and stoves at a final temperature of 162 deg.

In the refrigerating house vertical compressors with compound disconnected steam ends are indicated. With a view to using water and not brine for second-stage cooling, a Baudelot cooler has been provided. It is figured that the small building, 45 x 55 ft., suffices for the apparatus. He puts the cost of the plant, including foundations, building and cold-blast connections, at \$71,000. If the moisture be reduced to 1 grain per cubic foot instead of 1½ grains, the plant, he says, will cost \$4,200 more. If 60-deg. water be available for first-stage cooling instead of 75-deg. water, the costs would be reduced about \$7,000.

Aeroplane Building, Past and Present

The growth of aeroplane production and its present status are indicated by L. Goldmerstein, editor of the engineering survey, *Journal of the American Society of Mechanical Engineers*, in an article in the December *Bulletin of the Society of Automobile Engineers*. He says:

Twelve months ago there was a possible world output of flying machines of probably ten a week. There were two manufacturing companies in the United States, one more or less on the eve of trouble financially and otherwise, and the other, although strong financially, having built hardly any machines. Three French companies had gone into bankruptcy just before the war. In England the Royal Aircraft Company could build one machine a week with some difficulty, but did not. There were other companies in England which stated they could build one machine a month, the Grahame-White works claiming to be the biggest factory in Europe because it was able to build two machines a month.

At the present time fairly reliable although not official information is that in England 27,000 men are engaged in building heavier-than-air flying machines. In addition, there are men engaged in building auxiliary equipment such as magnetos and carburetors. It is no exaggeration to say that in Great Britain alone about 40,000 men are now engaged in aeroplane work. It is stated in Germany by well-informed people that the English factories have an output of 140 machines a week. The French factories are doing their part; several plants in the United States and Canada are doing theirs. In Germany four big factories have been turned over to aeroplane building, among them one of the largest plants of the Allgemeine Elektrizitäts Gesellschaft. As for Russia, no authoritative information is available. The world output of aeroplanes is accordingly now close to 500 a week; that is, however, only a small production compared with what we shall probably see within the next two years.

The American Metal Products Company, Milwaukee, Wis., has re-elected its board of directors and officers as follows: Peter J. Weber, president; Henry C. Brelié, vice-president; E. J. Eberle, secretary and treasurer; Richard Gaertner, manager, and Charles E. Helm and August Littmann, other directors. The officers reported that the plant was being worked to full capacity in the production of Ampco bronze, and that the many large orders pending necessitated the immediate installation of additional facilities.

Unprecedented Prosperity of Shipyards

Oil Tankers Lead in Aggregate Tonnage Under Contract—Some Deliveries in Three Years—Details of Proposed Shipping Bill

The unprecedented demand for American-built ships which has filled the seacoast yards with enough work to keep them employed at full capacity for from three to five years, is summed up in the January issue of *International Marine Engineering*. That journal has ascertained that at the present time over 200 large merchant vessels, totaling about 700,000 gross tons, are under construction. It states:

In addition to the merchant work, there are in private shipyards about 59 Government vessels under construction, aggregating 168,152 tons displacement, while, in addition to that, there are also building in the Government navy yards 12 vessels, aggregating 176,010 tons displacement, making a total of 71 Government vessels of 344,162 tons displacement now building in the United States.

The above figures, however, do not include the tonnage of 40 submarines, 11 of which are building for foreign navies, as the particulars of submarine vessels have not been officially disclosed.

Of the merchant vessels now under construction, 116 of 643,475 gross tons are large sea-going vessels, mostly over 3000 tons. Thirteen are over 10,000 tons each, 26 range from 7000 to 10,000 tons, 27 from 5000 to 7000 tons, 10 from 4000 to 5000 tons, and 42 from 2000 to 4000 tons.

The vessels now building may be classified as follows: Oil tankers, 48 of 343,851 gross tons; freighters, 53 of 228,041 gross tons; colliers, 9 of 39,855 gross tons; passenger and freight steamers, 6 of 31,728 gross tons.

OUTPUT OF SHIPYARDS IN 1915

During the year 1915 the aggregate tonnage of large sea-going merchant vessels built in the United States was less than has been the case for several years. Taking into account only vessels over 100 gross tons, there were built during the year 129 sea-going

Merchant Vessels Now Under Contract			
	No.	Gross Tons	I. Hp.
Newport News Shipbuilding & Dry Dock Company	16	120,399	43,400
New York Shipbuilding Company	22	107,639	38,070
Wm. Cramp & Sons Ship & Engine Building Company	13	71,500	46,400
Union Iron Works	10	69,240	30,800
Harlan & Hollingsworth Corporation	13	58,162	41,352
Maryland Steel Company	10	54,084	24,400
American Shipbuilding Company	12	49,100	18,000
Fore River Shipbuilding Corporation	7	49,000	21,200
Great Lakes Engineering Works	11	31,347	13,975
Toledo Shipbuilding Company	7	20,000	4,000
Baltimore Dry Docks & Shipbuilding Company	4	14,000	7,200
American Bridge Company	35	12,223	—
Chester Shipbuilding Company	2	11,600	6,000
Seattle Construction & Dry Dock Company	2	7,800	5,000
Kelly-Spear Company	5	3,380	—
American Car & Foundry Company	4	2,744	—
Pusey & Jones Company	7	2,320	1,150
Staten Island Shipbuilding Company	7	1,908	4,050
G. G. Deering Company	1	1,900	—
Manitowoc Shipbuilding & Dry Dock Company	4	1,880	1,650
Johnston Brothers	2	800	—
Percy & Small	1	800	—
Charles Barnes & Co.	2	720	400
F. S. Bowker & Sons	1	567	—
Ellicott Machine Corporation	3	540	1,950
Bath Iron Works	1	418	7,000
Anderson Steamboat Company	1	360	500
Dubuque Boat & Boiler Works	2	85	105

merchant vessels, aggregating about 173,223 gross tons. In addition to the merchant vessels, 18 Government vessels, aggregating 48,146 tons displacement were completed.

Of the sea-going merchant vessels built in 1915, 2 were over 10,000 tons; 4 were between 7000 and 10,000 tons; 10 were between 5000 and 7000 tons; 2 between

4000 and 5000 tons and 6 between 3000 and 4000 tons.

Classified according to types, the output was as follows: Freighters, 19 of 62,039 gross tons; colliers, 6 of 38,410 gross tons; oil tankers, 5 of 33,238 gross tons; passenger and cargo steamers, 10 of 15,014 gross tons; and oil barges, 9 of 3963 gross tons.

Although the figures for the output in 1915 are exceptionally low, they reflect the conditions in the American shipyards a year ago rather than at the present time. During 1914, scarcely any contracts of importance for merchant vessels were placed with American shipbuilders. Early in 1915, however, the oil companies began to place orders for large oil tankers and these were soon followed by orders from other steamship companies for large freight-carrying steamships. With this impetus, shipyards rapidly filled up with new work.

The greatest output of merchant tonnage in 1915 was from the Maryland Steel Company, Sparrows Point, Md., with the New York Shipbuilding Company, Camden, N. J., second. Including Government vessels, the largest output for 1915 was from the New York Shipbuilding Company. The accompanying tables give the number of merchant and Government vessels now under contract, their gross tonnage and indicated horsepower.

Government Vessels Now Under Construction

	No.	Gross Displacement	Tons I. Hp.
New York Shipbuilding Company	5	63,450	101,500
Newport News Shipbuilding & Dry Dock Company	2	63,400	63,000
Fore River Shipbuilding Corporation*24	24	30,842	77,000
Wm. Cramp & Sons Ship & Engine Building Company	3	3,290	54,000
Bath Iron Works	3	3,235	52,000
Craig Shipbuilding Company	19	1,750	1,500
Manitowoc Shipbuilding & Dry Dock Company	1	1,100	1,000
Seattle Construction & Dry Dock Company	14	1,085	20,000
Lake Torpedo Boat Company	88	—	—

*Includes twenty submarines, details of which are withheld. Ten are for Great Britain and one for Spain.

†Eight are submarines for the United States Navy, details of which are withheld.

‡Three are submarines for the United States Navy, details of which are withheld.

§All are submarines for the United States Navy, details of which are withheld.

For the following survey of the existing situation in the shipbuilding industry THE IRON AGE is further indebted to H. L. Aldrich of *International Marine Engineering*:

A year ago not many ships were under contract, but the prospects were for a large amount of business for the shipyards. Since then the shipyards in the United States have been filled with work enough to keep them running at least three years. There is about as much business in sight as there is under contract, so it seems a certainty that the shipyards will be running at 100 per cent of capacity on legitimate business, that is, without a trace of war orders or outside work, for probably five years, and many authorities say for ten years.

The war caught the United States in a most unfortunate predicament so far as vessels for service in the foreign trade are concerned. In the year, contracts for over \$100,000,000 worth of ships have been placed, and nearly every vessel to be built will be suitable for the foreign trade. Practically one-half of the tonnage under contract is for tank steamers, and as we all know tankers are used very largely in the foreign trade. The other vessels, with perhaps the exception of half a dozen, are freight steamers. A noticeable feature is that the oil tankers are of larger tonnage than heretofore contracted for. Over a dozen

of them exceed 10,000 gross tons. The freight carriers also are of considerably larger tonnage than usual.

MORE LARGE CONTRACTS ARE PENDING

"Within the past week I have been told by a leading shipbuilder that contracts are in suspense for over 25 large steamships, awaiting on steel makers to make known what guarantees can be given on plates and shapes. Three or four months ago the New York & Cuba Mail Steamship Company, generally known as the Ward Line, placed contracts for two freight steamships with the Seattle Dry Dock & Construction Company, Seattle, Wash., because more prompt deliveries were guaranteed by that company than could be promised by any yard on the Atlantic coast.

"As an illustration of the situation in the shipbuilding industry the following may be cited: The Savannah Line, a year or more ago, was considering the building of ships, but delayed action on account of deliveries and prices. The cost per ton of building vessels steadily increased, and deliveries were put further and further off. Finally the line placed contracts for two large coastwise passenger vessels, one to be delivered in 33 months and one in 36 months, and probably paid 25 per cent more for the ships than it would have paid had the orders been placed months ago. Early in the year there was little new work in the shipyards of the Great Lakes, but they have since been filled with work, several contracts having been placed for Lake carriers to be delivered in 1917.

TOOLS AND LABOR ARE INADEQUATE

"The columns of THE IRON AGE from time to time have reported the purchasing of machine tools by various shipbuilding companies, but many yards are suffering to-day from the lack of tools which cannot be delivered for months to come. There likewise is a shortage of labor in the shipyards, as ships are built and not manufactured. Some months ago one of the leading shipyards advertised in all parts of the United States for men, guaranteeing steady work and maximum wages for at least two years. Another yard had agents in the smaller cities in half a dozen states endeavoring to engage mechanics, carpenters and plumbers for steady employment. This is the only way in which the builders have been able to obtain men for months. The difficulty of securing deliveries of new tools and sufficient men to man the yards, coupled with the difficulty of securing steel and other supplies, is a serious handicap to the shipbuilding industry.

"A month ago a representative of one large company said that a great hindrance to operations was securing supplies of small things like condenser tubes. There must be a shortage of these tubes all over the world. The United States Navy is running short of them, and several English concerns have written, begging to be informed where they can secure quotations and deliveries as none can be found in the English market.

"Three interesting types of propulsion for steam vessels came to the front last year. Electrical reduction or propulsion has so far been limited in this country to war vessels. Turbine reduction gearing seems to be coming into its own, as we have been informed that over a dozen of these installations have been made, three or four running into several thousand horsepower each. The third form of propulsion, which is new to this country, so far as commercial vessels are concerned is by means of oil engines. From 12 to 18 vessels under construction will have oil engines instead of steam.

"All existing yards have added to their equipment. Some have built additional launching ways, and two new shipyards have been opened. The old Shooters Island yard, Newark Bay, N. J., has been purchased by the Standard Shipbuilding Company under the management of Wallace Downey, who was manager of the old Shooters Island yard. I understand this company has contracts for four or five vessels of about 6000 gross tons each. The site of the old Roach yard at Chester, Pa., has been purchased by the Chester Shipbuilding Company, which has contracts for at least two ships, both oil tankers.

REGARDS NEW SHIPPING BILL FAVORABLY

"There has been a great deal said about the new shipping bill which is backed by the Administration at Washington. So many stories have been current about the bill that I lately spent a week in the capitol seeking information. From what I learned, I judge that of all the measures which have been presented for building up the American merchant marine, this new one, as described to me, is the best one yet proposed. In the twenty years I have been connected with the marine business, attempt after attempt has been made in Congress to pass a subsidy bill and all have failed. To make another attempt would be futile, as the people of the country do not favor it. During all these years there has been talk about a preferential duties bill; but that gave promise of untold retaliation on the part of foreign nations, and was so sure to cause trouble that it has been given up. Another important thing that has hampered the operation of American ships in the foreign trade has been the fact that mortgage bonds on floating property in the foreign trade are not properly protected by Federal laws. As the result of this situation, the manager of one of the largest steamship companies ever owned by Americans told me that in spite of the great prosperity of his line he was forced to pay from 12 to 14 per cent for money.

"Then, to cap the climax, came the so-called seamen's bill. The present Congress will not modify the seamen's bill according to the general opinion in Washington. Neither will it pass a subsidy bill, or a preferential duties bill, nor will it strengthen the law to make more secure mortgage bonds on floating property. During many months past the Administration has consulted leading steamship men, admiralty lawyers and others interested in shipping, and has formulated a bill which probably will be presented to Congress in a week or two. It is proposed that the Government assist steamship companies to raise money to build ships; loan them money so that its cost shall not exceed 7 per cent. It is not intended that any of these new ships shall be run in a way to compete with existing lines. They will run on routes not now traversed by American ships. No ships are to be purchased under this proposed law, but all are to be built, and the plan is to make them the most economical ships possible. They are to be so constructed as to be available as naval auxiliaries in case of need.

PROVISION FOR PAID NAVAL RESERVE

"All masters, watch officers and seamen employed on ships which come into existence through the proposed bill, who are American citizens, will have the privilege of becoming members of a special naval reserve and will receive compensation as such naval reservists during the time they are employed on the ships. Other features of the bill are equally interesting. If the bill becomes law it will mean at least \$50,000,000 worth of ships, with the assurance that they are really to be built. I am told that leading concerns have agreed to enlarge their yards to aid the Government in having the vessels constructed as expeditiously as possible.

"The future of the American merchant marine looks brighter to-day than at any time in the last half century. Ships are being built as cheaply in this country as in any other. Only a few days ago a consular report stated that the cost of building ships in Japan was \$100 per ton. This is a higher price than ship-builders have charged in this country. When the war is over, the merchant marine of all the belligerents will be in a deplorable condition. The interned ships of Germany and Austria have been deteriorating to the extent of 15 to 25 per cent a year. Furthermore, most of these ships are several years old and will not be as economical to operate as the ships now building.

FOREIGN SHIPS FAST DETERIORATING

"The ships taken over by the allied governments have been run without any regard to their preservation, and when restored to the various merchant marines will be found in bad shape. Since the war started very little merchant marine tonnage has been

built in any of the belligerent countries, so that there will be an enormous demand for new tonnage as soon as the war is over. It must be borne in mind, also, that many millions of men have been killed, and probably twice as many maimed or incapacitated for work, so that when peace is declared and merchant ships get back to their legitimate field, wages must of necessity be far higher on all ships flying foreign flags than they were before the war. Another important point is that the war is costing fabulous sums of money on which interest must be paid. The only way to find this interest is by additional taxation. It does not seem that there can be any question that great corporations like steamship companies will have their taxes enormously increased when peace returns. Within two weeks I have heard of an American who chartered

a ship flying the English flag. He is making tremendous profits, but 50 per cent of these go to the British Government as taxes. Incomes of individuals in Great Britain are taxed 25 per cent and they can hardly be less after the war.

"Therefore, when peace is restored, with the increased cost of labor in making the plates and shapes and other metal products that go into the construction of ships, with the increased cost of other materials, the additional taxes, higher cost of labor for operating the ships, etc., it does seem that it will cost more to run ships under foreign flags than it ever did. The American merchant marine has a bright future, particularly in the foreign trade, in which we have so long been inactive, if Congress will only give it some help."

The Corrosion of High Chromium Steels

Importance of This Alloy in Eliminating Rust—Tests by Sir Robert Hadfield—The New Stainless Steel

The corrosion of steel alloys, particularly high chromium steels, is dealt with in a paper by Sir Robert Hadfield read before the Faraday Society of England, Dec. 8, 1915. There is in it an interesting reference to the new "stainless" steel, first mentioned in THE IRON AGE, Feb. 4, 1915. An abstract of the paper follows:

Exaggerated claims were made a few years ago that nickel steel would resist corrosion. No doubt if the metal is present in high percentages the product is more highly resistant but in the end it will also corrode and quite badly. Moreover, as regards ordinary commercial nickel steels of lower percentages, while they show somewhat lower corrosion, it is found that when deterioration once commences corrosion continues at a not much less rate than in ordinary steel. A special alloy known as "stainless steel" has recently come before the metallurgical world. Great credit is due to Thomas Firth & Sons, (England) to H. Brearley and others for the work they have done in this matter.

In the author's paper on "Alloys of Iron and Chromium," read before the Iron and Steel Institute in 1892, it was pointed out that an alloy containing about 9.18 per cent chromium and 0.71 per cent carbon showed a loss of 5.64 per cent after being immersed for 21 days in sulphuric acid of 50 per cent volume, compared with 44.7 per cent loss of wrought iron. Table 1 shows the

results of the corrosion tests, and Table 2 of the mechanical tests.

On recently referring to a number of the test bars, prepared in 1892 and tested in connection with the research above mentioned, it was found that the specimens containing the percentages of chromium in question, and particularly specimens Nos. 1176M and 1177M, were on the whole quite bright and practically free from rust. The foregoing is a remarkable confirmation of the importance of chromium in this particular percentage combined with iron, conferring upon such an alloy practically freedom from rust or corrosive properties compared with ordinary iron and steel. No special care was taken with the test bars in question. They were filed away in our research laboratory in Sheffield, and had never been touched during this interval of about twenty-three years. Table 2 shows the data with regard to these particular specimens. It will be thus seen that the author produced an alloy of iron and chromium offering great resistance to corrosion and somewhat similar to the "stainless" steel previously mentioned.

With reference to the interesting material of the kind to which the term "stainless" has been given. Table 3 gives the analysis and mechanical tests carried out by the author on this and similar material made by him. It will be noticed that the carbon is much lower than in the chromium iron alloys produced by him in 1892. This new steel, which has been used for table cutlery, is stated neither to rust nor tarnish in contact with food or acids. It is now making great headway. The author believes that cutlery manufacturers are making use of it on quite a large scale, for, although the cost is considerably more than knives made from ordinary steel, it is much superior in its anti-corrosive qualities.

A short time ago the author had some interesting correspondence with Sir John Wolfe Barry, who asked him what he considered to be the value of this high chromium steel as to its practical application, and whether it could be used for parts of dock gates and other purposes, where corrosion is very considerable;

Table 1.—Results of Corrosion Tests Made in 1892

Mark of the Specimen (Bar Steel) in the Hadfield Research	Percentage of		Strength of Acid (H ₂ SO ₄) Per Cent	Length of Immersion Days	Loss, per Cent	Color After Treatment
	Car- bon	Chro- mium				
Chromium steel (F)	0.27	1.18	50	21	3.32	Bright appearance in some parts.
Chromium steel (J)	0.77	5.19	50	21	4.78	Tarnished; no bright appearance.
Chromium steel (L)	0.71	9.18	50	21	5.64	Dull and tarnished.
Silicon steel (E) ...	0.20	2.67	50	21	3.32	Very bright appearance.
Ordinary mild steel ...	...	...	50	21	7.48	Dull bright.
Wrought iron ...	...	...	50	21	44.70	Most brilliant.

Table 2.—Data of Tensile Test Bars Prepared Sept. 24, 1890, and Examined March 12, 1915

Specimen	ANALYSIS, PER CENT						Treatment	TENSILE TESTS				Bending Test, Broke at
	C.	Si.	S.	P.	Mn.	Cr.		Elastic Limit, Tons	Max. Load, Tons	Elong., per Cent	Reduction of Area, per Cent	
1176M ...	1.27	0.38	0.10	0.03	0.25	11.13	Unannealed. Annealed for four days at a high red.	30 to 35	62	10	11	24 deg.
1177M ...	1.06	0.63	0.12	0.06	0.08	10.83	Unannealed. Annealed for four days at a high red.	35 to 40	72	5	12	14 deg.

Steel No. 1176M.—The unannealed is still bright, except for a patch of rust on one side. The fracture is slightly rusted. The annealed bar is similar.

Steel No. 1177M.—The unannealed bar is mostly quite bright, but there are fairly large patches of rust. The fracture is completely rusted. The annealed bar is only very slightly rusted in places. The fracture is completely rusted.

also whether it could be produced in the form of plates, angles and other products.

In Table 3 will be found a considerable number of mechanical tests on this particular steel. The elastic limit and tenacity vary according to the heat treatment. The elastic limit of the forged material is high, varying

whether high-chromium steels are adapted for resisting corrosion—as for instance, that of sea-water on parts of dock gates, etc.—that full and proper tests should be first carried out, for example, in sea water and other media.

In order to determine the corrosion of the metal

Table 3.—Mechanical Tests on Steel of the Type Known as "Stainless"

Steel No.	Analysis, per Cent						Treatment	Tensile test				Shock Test				Sclerometer.	Ball Test Mohs.	Corrosion Test 21 Days in 50% Solution of H ₂ SO ₄	
	C.	Si.	Mn.	Cr.	Co.	Fe.		E.L., OUTSIDE MATERIAL	Tons	B.L., Tons	Elong., %	R.A., %	"C" Nick.	Nick. "No" Nick.					
2498	0.28	0.01	0.12	12.7	0.45	86.6	Blade bent through angle of about 25° before breaking.												
2498A	0.35	...	...	...	...	...	775° (F.)†						4.7	12°		Too thin for ball test. Easily fileable.	6	255 on shock, 600 on bar as received on shock	
3432	0.35	...	...	11.66	...	...	MATERIAL MADE BY HADFIELD. { Cast 1100° Air	14.5	37.6	29.5	54.9	2.6	6°	42	115°	Ball Test Bar	185		
							{ 775° (F.)	28	44.5	27	51.6	5.1	16°	29	104°	As c't' As f'gd	228	As forged 0.046	
3433	0.41	...	...	10.14	...	...	{ Cast 1100° Air	34	51.4	12	13.7	2.6	5°	7	18°	600 1100° Air 645	212	775° (F.) 0.037	
							{ 775° (F.)	33	49.4	13	26.7	3.5	10°	31	78°				
3433-2	0.29	...	...	12.84	...	...	{ Cast 1100° Air	14	34.6	32.5	50.3	3.1	10°	54	127° Utsbr		146		
							{ 775° (F.)	27.5	42.3	29	61.5	12.5	44°	51	135°		177		

†"F" = cooled in furnace.

*Further ball tests on steel No. 3,433. The samples were 1/2 in. sq. × 1 1/2 long (1/8 in. ground off surface).

775° quenched in oil	328
775° quenched in water	328
830° quenched in oil	321
830° quenched in water	324

Table 4.—Corrosion Tests on Various Steels for Comparison with High-Chromium Steels

All specimens were immersed for 21 days in a 50 per cent volume solution of Sulphuric Acid.

Steel No.	ANALYSIS, PER CENT							Cast or Forged	Treatment	Corrosion, per Cent Loss 1.96	Corrosion Loss per Sq. Cm. per 0.0152
	C.	Si.	Mn.	Cr.	Ni.	W.	Cu.				
2239 American Ingot	0.03	0.01	0.015	...	...	...	...	Cast	895 O. 790 F. 540 F.†	9.06	0.0647
Iron	...	...	...	0.06	...	...	...	Forged	895 O. 790 F. 540 F.	6.30	0.0450
2235	0.31	...	...	...	...	...	...	Forged	940 O. 615 W.‡	9.95	0.0710
2020 L	0.28	0.19	1.40	...	...	...	...	Forged	940 O. 615 W.	9.23	0.0658
2228	0.52	0.05	0.06	...	...	...	...	Forged	940 O. 615 W.	7.90	0.0564
1618	0.52	0.00	0.62	...	...	...	...	Cast	940 O. 615 W.	7.25	0.0517
1991/2	0.97	0.11	0.13	...	...	...	...	Forged	940 O. 615 W.	8.35	0.0595
1905	0.76	...	0.95	...	...	...	...	Forged	940 O. 615 W.	7.40	0.0528
2054	0.29	0.29	1.17	0.81	...	...	...	Cast	970 W. 560 A.‡	7.51	0.0536
2231	0.30	0.21	1.44	0.56	2.10	...	...	Forged	970 W. 560 A.‡	7.00	0.0714
2232	0.25	...	...	...	...	...	...	Cast	830/680 W. 725 F. 615 W.	7.10	0.0507
2001	0.44	0.09	0.35	...	...	3.51	...	Cast	940 O. 615 W.	5.89	0.0420
2229	0.26	...	0.34	...	3.44	1.65	...	Forged	940 O. 615 W.	8.40	0.0600
1498	0.84	...	0.07	...	2.04	2.10	...	Forged	As forged	6.84	0.0488
2233	0.28	...	0.95	...	1.94	2.78	...	Cast	830/680 W. 725 F. 615 W.	7.05	0.0503
1773 J	0.35	0.10	0.33	2.82	...	18.90	...	Forged	830 O. 615 W.	2.75	0.0199
1957	0.26	0.21	0.44	...	...	1.06	...	Forged	725 F.	6.35	0.0454
1177 M	1.06	0.63	0.08	10.83	...	...	...	Forged	1000 A. 775 F.	3.85	0.0275
3433	0.41	...	...	10.14	...	...	...	As forged		5.62	0.0380
3133	0.41	...	...	10.41	...	...	...	As forged		6.44	0.0460
								Forged	775 F.	5.13	0.0370

**O" = quenched in oil. †"F" = cooled in furnace. ‡"W" = quenched in water. †"A" = cooled in air.

from 28 to 33 tons per square inch, breaking load 44 to 50 tons; the elongation is excellent when the material is annealed, being as high as 27 per cent in 2 in., with a reduction in area of 50 per cent. The ball hardness in this case is 185. As shown in the table, a forged bar of this material after being annealed would give a drop tup test of no less than 20 kg. (Frémont system) with a bending angle of 104 deg. before breaking. The material requires considerable care in forging and rolling, but there is no doubt an important opening could be found for this valuable product, of which probably this present paper is the first to put before the world full and detailed information as regards its composition and mechanical qualities.

Rather singular to say, this steel does not show satisfactory corrosion resistance in 10 per cent sulphuric acid solution. The alloy steel containing 10 per cent shows a loss of 18 per cent, and that with 15 per cent chromium a loss of no less than 33 per cent. In the author's own laboratory these tests have been confirmed. It would therefore be well, in order to determine

chromium itself, the author experimented with a number of specimens of metallic chromium containing 99.35 per cent chromium. The results show that this metal is readily soluble in dilute and strong hydrochloric acid; insoluble in dilute and strong nitric acid; soluble and slightly soluble in dilute and strong sulphuric acid.

The author has carried out from time to time on various steels a considerable number of researches with regard to corrosion tests. These are shown in Table 4. The test consisted in immersing the specimens for twenty-one days in a 50-per cent volume solution of sulphuric acid.

The local court has permitted the receivers of the Central Iron & Steel Company, Harrisburg, Pa., to contract for a year's supply of ore from the Mohawk mine, Minnesota, through Picklands, Mather & Co., Cleveland, Ohio. By the arrangement thus sanctioned the receivers will take 65,217 tons of ore from the Mohawk mine in addition to 8071 tons remaining undelivered when Lake navigation closed last year.

The Story of the Grinding Wheel*

How It Has Developed, Some of the Odd Uses to Which It is Put and How It is Sometimes Abused

BY C. W. BLAKESLEE

Looking back several years calls to mind the crude and imperfect state of the grinding industry in those days. I call to mind how imperfect was the practice of using grinding wheels compared to the present time. Very seldom was an order received with the request for any particular class of grinding. Usually the order would simply specify the size of the wheel only. If the size was to be had the customer received the wheel and no further questions were asked and very few complaints, if any, made as to the action of the wheel upon the work. Wheels that were furnished for general work or rough grinding were evidently as good for tools. If a sharp, keen edge could not be obtained on this class of wheel they would grind as near as possible to the desired sharpness with the wheel, and the final keen edge was finished on the old oil stone, thus eliminating the necessity of the wheel manufacturer losing sleep over the unsatisfied customer.

Without the determination of progress on the part of the grinding-wheel manufacturers of the United States, those conditions would be the same to-day. Not an industry of any kind has used greater energy to bring efficiency and lower cost of production to the steel and iron-working plants of the world than have the grinding-wheel manufacturers. Very few, if any, materials of any kind, including steel, iron, brass, wood, aluminum, glass, leather, rubber, etc., have not in some stage of their manufacture been introduced to the grinding wheel. The use of the grinding wheel is unlimited. In every manufacturing plant, both large and small, regardless of the class of material used, the grinding wheel is in evidence.

The most peculiar order which I have ever received was an order for a 2 x 12-in. wheel for grinding hams. I at first thought some joker was on the job, but decided to make closer investigation before casting the matter to one side. I finally found that the customer really wanted the wheel and wanted it for the purpose of grinding hams. It proved to be one of the large packing firms at the Chicago Stock Yards. The wheel was furnished accordingly and did the job of surfacing off the sides of hams preparatory to stenciling them. This further demonstrates there is no limit to the use of the grinding wheel.

ACCIDENTS THROUGH CARELESSNESS

The lives that have been lost and the serious injuries that have happened in the past twenty years, to my knowledge, through the unnecessary breakage of grinding wheels is appalling. In late years, however, a small percentage of serious accidents have happened in comparison to former years due to the fact that the safety-first campaign has been strongly in evidence. Safety devices have been installed on the grinding stand and more consideration in every way has been given the conditions surrounding the grinding wheel. The users in general have finally conceded the fact that the wheel manufacturers use every precaution to make the grinding wheel as safe as human genius will permit, and that they must do their part toward giving the wheel the proper protection against breakage. Many lives have been lost through the use of worn out grinding-wheel stands that should have been sent to the cupola years before they were. Some of these grinding stands I have seen in operation over twenty years with worn-out bearings permitting the spindle to shake over $\frac{1}{4}$ in., the spindle sprung out of true, too small

a flange and not relieved, flanges sprung so that they do not come in contact with the wheel at the outer edge, one flange smaller than the other, the tightening nut all battered from setting it up against the flange with hammer and chisel, part of the driving pulley chipped out, only part of the hand rest left, machine on flimsy foundation and no protection hoods. These are a few of the many reasons which cause the breakage of wheels and are conditions that should be eliminated and discouraged by every grinding-wheel salesman. In fact, where such conditions exist manufacturers should refuse to furnish grinding wheels. Many first-class makes of grinding wheels have been condemned on account of breakages which absolutely were not in any way caused by the faulty workmanship or material, but strictly on account of worn out and flimsy grinding stands, together with the rough usage of the wheel. Consequently the grinding-wheel manufacturers must have the co-operation of the wheel users and proper protection and treatment given the grinding wheel to eliminate useless and serious accidents.

It is unwise and bad practice for any grinding-wheel manufacturer to endeavor to convey the impression among users that no danger lies in the use of his particular make of wheel. Where confidence has been established that there is perfect safety in the use of this or that make of wheel less attention is given to safety protection. The grinding wheel is dangerous and great care should be exercised in its use. Safety hoods and other safety devices should be provided.

High explosives are dangerous, yet most necessary. There would be just as much judgment used in trying to educate the users of high explosives that this or that kind of an explosive could be handled in most any manner without any fear of danger as for the wheel manufacturers to try to convey the impression that grinding wheels of any kind are safe without protection and great care in their use.

To educate the trade that grinding wheels are dangerous to use is not going to lessen the demand for them. They are an absolute necessity the same as high explosives, but they must be handled with care. Wherever a grinding wheel is broken in use regardless of the particular make, close investigation of the cause of breakage should be made by the salesman who in many cases believes that he has profited through the breakage of the competitor's wheel. He must realize that breakages under the same conditions are liable to occur to any make of wheel.

UNFAIR CONSIDERATION

The manufacturers of files, taps, drills, hacksaws and other shop tools are seldom, if ever, called upon to make replacements in cases of breakages excepting in rare cases where evidence of defects in the manufacture of those tools is shown. They are not, however, immediately condemned on account of breakage, as is most generally the case of the grinding wheel. The fault is usually laid to the carelessness of the operator, but not so with the breakage of the grinding wheel. The operator simply states, "The wheel broke without any apparent cause," and further states that he refuses to work on that particular make of wheel because "it broke," and in most cases he is usually sustained by the powers that be. In all fairness, why should not the operator of the grinding wheel be reprimanded for unjust treatment of the wheel the same as the one who uses other classes of tools in the shop? The mere fact that workers are not killed or badly injured in the breaking of other classes of shop tools does not alter the principle of the case in the least. The same consideration ought

*From a paper read at a recent conference of the salesmen of the Abrasive Material Company. The author is manager of the company's Chicago store.

to be given the grinding-wheel manufacturers as is given manufacturers of other lines of tools.

INSTALL HIGH GRADE MACHINES

The highest grade wheel stands possible should be installed. See that flanges are fully one-half the diameter of the wheel and recessed, that steel protection hoods are provided and insist that careful treatment be given the wheel. Place the grinding-wheel stand upon a rigid foundation and doubtless no accidents will occur through breakage of the grinding wheel.

When the list of machinery is submitted to the bidder, specifications of the construction of the various machine tools are given, the lathe must have a certain size spindle, swing, distance between centers, depth of bed, ratio of the gearing for power, weight, etc. Practically the same conditions apply to the planing, drilling, milling and shaping machines, etc.

The grinding-wheel stand is usually the last machine on the list of tools specified. It is given the least consideration of any tool in the shop. The specifications for the machine usually read: "Grinder to carry two wheels of certain diameter." Consequently a proposal is entered by the bidder to show the lowest cost possible. In many cases where the question is put to the buyer as to the kind of a grinding machine he would like to purchase he will usually state: "Most any old thing will do, just so it will carry two wheels of a certain diameter." More times he will state, "If you have a second-hand grinding machine it will do." Buyers of machine tools should, in fact, give greater consideration to the specifications of the grinding stand, owing to the rough usage it receives and the danger in its use, than any other machine tool.

It seems strange, yet true, that where a workman is in danger of getting a finger or hand taken off in slow traveling gears you will usually find guards carefully provided, but where he is very likely to lose his life through the breakage of the grinding wheel practically no protection is given.

FINISHING BY GRINDING

In late years what a tremendous advancement has been made, especially in precision grinding. I recall about fifteen years ago the first large cylindrical grinding machine was offered to the trade. When one of the principal inventors of the machine called on the big engine builders in the Middle West, well do I remember how little consideration was given the man who was years ahead of the times, as is proved by the fact that thousands of those very machines are used for the purpose of roughing as well as finishing by grinding the world over at the present time. Three of the most important objections made at that time to the grinding machine were: The belief that the particles of emery would imbed themselves in the work, that the wheel would be reduced anywhere from $\frac{1}{8}$ to $\frac{1}{4}$ in. in grinding from one end of the work to the other and further that the price was entirely too high for a grinding machine. Argument after argument against installing the machine even on trial was brought forth. "No, sir, there was nothing to it." The method of finishing in the lathe with a water tool, a file, an emery cloth fastened to a "slapstick" and oil could not be beaten, but the inventor knew he was right.

Strange to note, where water some years ago was considered most essential for milling and gear cutters, reamers, slitting saws and such fine edge tools, practically no water is used at the present time on these classes of fine edge tools excepting, of course, the larger class of inserted tooth milling cutters and reamers, thus demonstrating the wonderful advancement of the wheel manufacturer to a position to furnish extremely soft, porous and consequently cool cutting wheels. With the proper grain and grade no water need be used in sharpening this class of tools. The use, however, of self-hardening, high-speed tool steel has assisted greatly in this respect.

ROUGHING AND FINISHING WITH THE SAME WHEEL

Just a few years back, and in many cases even at the present time, the general impression is that to ob-

tain a fine finish it was necessary to use a fine grain wheel. This practice and belief, however, is practically done away with, demonstrating the rapid and improved methods employed by the wheel manufacturers who have educated the users of wheels that the desired finish on a piece of work can be had through the changes of work and wheel speeds, together with the traverse of the grinding-machine bed. In a great majority of cases roughing and finishing can be accomplished with the same wheel through the many change feeds provided on the modern cylindrical grinding machine. By revolving the work slowly, taking a heavy cutting feed and traveling the work longitudinally at high speed, it would naturally leave a coarse finish and consequently reduce stock rapidly, and by advancing the work speed, taking a light cut and slowing up the traverse of the work, a very high finish can be obtained with the same wheel. Often where a satisfactory wheel is furnished to conform to a set feed, the changing of the work speed will change the action of the wheel in such a decided manner as to render it worthless for the work it was intended. It is also true that many times where a wheel is apparently unsuitable for a certain class of work, through the manipulation of change feeds and wheel speeds, very satisfactory results may be brought about, thoroughly demonstrating that the several changes of feeds placed on the modern cylindrical and other classes of precision grinding machine are placed there for a purpose.

If a wheel does not produce the desired results in conformity to the immediate set of feeds, it should not be condemned before various changes of feeds and wheel speeds are tried out.

Machining manganese steel is commercially an impossibility. Here again the grinding wheel makes one of the greatest steel products of the world a success by playing its most important part in bringing to size all sizes and shapes of manganese castings. Fifteen years ago manganese was practically introduced in the United States for the first time commercially. At the present time many hundred tons per day are being cast throughout the United States and being used extensively the world over. It is used in the manufacture of frogs and switches, dredge buckets, safes, heavy driving gears, rolls, etc., where tremendous strength is necessary. Its extreme toughness accounts perhaps for the success of grinding manganese steel, although this toughness will ruin any tool steel in quick time. You will find wherever manganese castings are finished to size all kinds of machine tools are converted into grinding machines, demonstrating the importance and necessity of the use of the grinding wheel in the finishing of manganese steel.

GRINDING OF CRANK AND CAM SHAFTS

Perhaps nothing in the field of grinding is of more importance than is the finishing of automobile parts, particularly crank and cam shafts. The crankshaft in many cases is ground from the rough forging, depending upon the particular style of throw. If the clearance of the crank throw is such as to permit the wheel a clear passage to the crank pin the method of grinding from the rough forging is usually employed. However, where it becomes necessary to remove the stock from the sides of the crank throw, it is more economical to rough turn the crank pin in the same set-up and finish by grinding. The camshaft in most cases is rough ground from the forging, case hardened and finished with a softer and finer wheel. The use of the grinding wheel for the finishing of all parts of automobiles is beyond description. Internal, cylindrical and surface grinding of all parts of the automobile are thoroughly responsible for the perfection obtained.

One of the most important suggestions to the operator of a crank grinding machine is to make sure that the carrier of the lathe dog is most securely fastened to the work so that there may be no possible chance of the shaft slipping in the carrier. This is mentioned for the reason that very serious accidents have happened through this oversight, as nothing will break a wheel quicker than to have the work slip in the carrier. Cases of this kind have happened and the fault of the breakage laid to the wheel being cracked or defective, no

other reason being visible. Another advisable suggestion to prevent accidents of this kind is to keep the work centers of the machine well oiled. Do not let them run dry or the same results are likely to happen as described above without detection of the real cause of breakage.

An increased demand for ring wheels for side surface grinding has been quite noticeable in late years. Several of the prominent manufacturers of disk grinding machines have provided cylindrical chucks to attach to such machines. These previously were considered for use in finishing only, but in recent years have developed wonderfully in the way of roughing as well as finishing. Therefore the ring or cylinder wheel equipment furnished with the disk grinding machine makes a very desirable and indispensable grinding machine, as the work can be roughed down on the ring wheel at one end of the spindle and rapidly brought to size with a high finish through the use of the emery circle mounted on the steel disk at the other end.

The swing frame grinding machine without proper safety appliances is nothing more nor less than a death harness. The operator is obliged to handle the grinding wheel, placing himself between two handle-bars. This machine is indispensable on many classes of work, especially large and irregular shapes which cannot be brought to a fixed floor stand. Therefore this type should be given special care in protection against possible wheel breakage. Another dangerous operation for which the swing frame machine is employed is that of grinding grooves in frogs and switches. It requires an experienced operator to travel a grinding wheel back and forth in groove grinding of any kind. The least thrust sideways wedges the wheel in the grooves and usually breaks it. A steel safety hood, protecting the workman from flying pieces, should be installed on every machine. This also applies as well to the flexible shaft machine, which in many cases is used for the same operation or wherever it is impossible to bring the work to the wheel.

THE FUNCTION OF FLANGES

The flange plays a very important part in the protection and support of the grinding wheel. Opinions differ somewhat as to the diameter of flanges relative to the diameter of the wheel. However, my opinion is that the minimum diameter of flanges should not be less than one-half the diameter of the wheel and as much larger as possible consistent with grinding conditions. If possible use more than one set of flanges so that changes can be made as the wheel wears down. Objections are sometimes made against large-diameter flanges on account of interfering with the grinding on the side of the wheel. If it becomes necessary to do any amount of this class of grinding it is advisable to equip the floor machine with a cylinder to carry ring wheels, which are made especially for side grinding, or the cup wheel with a protection hood. However, if the straight wheel is used for this purpose, do not forget that an unusual strain is put on the wheel and the greatest of judgment should be used in this operation. Side grinding on a straight wheel should be discouraged wherever possible and cylinder wheels recommended.

Grinding on the top of the wheel is a very dangerous operation. Many serious accidents have resulted in this method of grinding. If the work is allowed to ride over the wheel to the front it is likely to catch on the wheel and be carried rapidly to the hand-rest. The crash usually results in a broken wheel. While this class of grinding is extremely dangerous and should be discouraged, yet if such method becomes absolutely necessary, the operator should by all means place himself back of the machine so that the wheel will revolve from him rather than toward him as is the case when standing in front of the machine. This would prevent the wheel from at least catching the work and snapping it down to the hand-rest.

Press dispatches state that Alfred D. Warner, Jr., and Emil J. Luter have been appointed receivers for the Jordan Machine Company, Norristown, Pa. The company was doing a profitable business, but was short of ready cash.

A Portable Type All-Steel Floor Crane

An all-steel portable floor crane is being brought out by the Brown Hoisting Machinery Company, Cleveland, Ohio. The all-steel construction is a very important feature as it makes a strong crane and at the same time one that is unusually light considering its strength, so that less energy is required in pulling



An All-Steel Portable Type Floor Crane in Which the Pulling Handle Serves as a Lock for the Wheels

it along a shop floor than a crane of heavier type. The crane has a wide wheelbase to allow side pressure without tipping and a good overhead reach. The hand winch is located on the outside of the mast and the hoisting shaft is placed so that it will not strike a bulky load. When the pulling handle is in an upright position it locks the wheel and holds the crane stationary. The crane can be equipped with a hand winch and tackle or the winch can be taken off and a chain block put in its place.

The crane is built in two sizes, 1½ and 3 tons. A special garage size is also built, this being longer and having a higher reach. The standard or 1½-ton crane has a wheelbase of 3½ ft. with a clearance between the front wheels of 2 ft. It has a lift of 5½ ft. and the overhang of the mast is 2½ ft. The wheelbase on the 3-ton crane and of the garage type is 4 ft. and the clearance between the front wheels is 3 ft. The 3-ton crane has an overhang of 3 ft. and a lift of 7 ft. Both it and the garage crane have roller bearings on the wheels.

Fire Company Rules of the Youngstown Sheet & Tube Company

The fire department of the Youngstown Sheet & Tube Company, Youngstown, Ohio, consists of a fire chief, an assistant fire chief and a number of fire companies. Each fire company is composed of a captain, a hydrantman, two nozzlemen and four hosemen. Each member of a fire company receives in addition to his regular wages \$1 per month, providing he drills twice each month, payable before July 4 and Christmas of each year. The company has printed the fire company rules, outlining the duties of the different officers and members.

The National Steel Car Company, Hamilton, Canada, is stated to have received an order for 4000 steel cars for the Paris, Lyons & Mediterranean Railroad, France. The cars are to be of the latest American model and are to be delivered as fast as they can be turned out.

Important Work of Bureau of Standards

Investigating Causes of Failures of Railroad Materials and the De- velopment of Improved Processes

WASHINGTON, D. C., Jan. 18, 1916.—An interesting summary of the work accomplished the past year and projected for the coming year, in the investigation of the causes of failures of railroad materials, the finishing temperatures of rails, sound ingot research, the determination of standard methods for the analysis of pig iron and iron castings and other problems in metallurgy and the chemistry of iron and steel, is embraced in the forthcoming report of the director of the Bureau of Standards for 1915. Special interest attaches to the metallurgical work of the bureau for the reason that it has been conducted in co-operation with such high class technical organizations as the American Society for Testing Materials, American Institute of Mining Engineers, American Institute of Metals and American Chemical Society.

CAUSES OF FAILURES OF RAILROAD MATERIALS

In conjunction with the engineering and chemical divisions of the bureau, a comprehensive series of investigations of the causes of failure of railroad materials has been undertaken by the metallurgical division, including some of the fundamental problems in the manufacture, design, and properties of rails, wheels, tires, and axles, as related to their failure in service. In the past year considerable necessary equipment has been assembled and a start made on several problems, including sound-ingot research, rail-finishing temperatures, transverse fissures in rails, properties of cast iron, thermal analysis, and metallographic methods of examination. A very important event in this connection was a meeting held at the bureau in May, 1915, attended by the technical representatives of 24 railroad systems, at which the work of the bureau on railroad materials was discussed and a plan of cordial co-operation inaugurated, including the furnishing by the railroads of statistics of failures and material for examination. This meeting was fully reported in *THE IRON AGE* of June 3, 1915.

CAUSES OF FAILURES IN CARWHEELS

A study of carwheels is projected, in view of the fact that they constitute one of the principal causes of railroad accidents, and there are many matters of uncertainty as to best practice in manufacture and design. There are, for example, over 20,000,000 chilled cast-iron wheels in use in the United States and they are interchangeable from one road to another, so that specifications should be rigid and uniform. Some of the items to be studied are statistics, foundry practice, mixtures used in manufacture, effect of sulphur on properties, braking and internal strains, strength of and best design, properties of hot cast iron, soaking pit practice, and relation of combined carbon to annealing.

TRANSVERSE FISSURES IN RAILS

The problem which the railroad conference of May 22, 1915, considered the most urgent is the determination of the causes of transverse fissures, meaning a hidden defect or split in the rail which often makes its occurrence evident only by the rupture of the rail by a train. A series of questions on this subject have been submitted to practically all the railroads in the United States, asking for their experience, data and samples, and for suggestions as to methods of attack. The replies which are being received will be a most valuable guide in orienting this investigation, which will involve work in the laboratory, mill, and service, including trials of artificial production of such fissures by several methods, metallographic and chemical surveys of rails containing fissures compared with sound rails, examination of rails which have withstood long,

severe service, and the effects of mill practice, including internal strains, gagging, and the completion of the chemical reactions across the rail section as influenced by manufacture. It is also hoped to have the co-operation of the optics division in the determination of the variation of expansion coefficient across the rail section.

FINISHING TEMPERATURES OF RAILS

The subject of finishing temperatures is regarded by the bureau as one of the greatest importance in rail manufacture, and the recent discussion of the problem has brought out a general confession of ignorance of many matters connected with the relation of methods of manufacture to the resulting properties of rails. The bureau hopes to be able to aid in the solution of some of these outstanding uncertainties. The bureau's investigation has already shown that the shrinkage clause in rail specifications, such as those of the American Society for Testing Materials (defining the finishing temperatures by the shrinkage of the rail) does not fulfill the intended requirements of its framers in limiting the temperature to slightly above the recalcitrance point. The rail committee of the American Society for Testing Materials presented a report concluding that "there is lacking anything which points to such decided differences in the quality of rails rolled at varying temperatures as theoretical considerations have led some of us to expect." The society has instructed its rail committee to co-operate with the bureau in a further investigation of this important matter. The bureau also proposes to study several allied questions, including the relation of rail section to the temperature distribution on cooling, and the relation of the latter to the completeness of the chemical reactions, internal stresses, and metallographic transformation for different sections and compositions of rails.

SOUND INGOT RESEARCH

The use of only sound steel ingots for the manufacture of rails and other structures, on which the safety of the public depends, is a matter of the greatest importance. With the co-operation of several steel manufacturers, the bureau has been enabled to compare the behavior and properties of several types of ingot, including the Hadfield form, consisting in (1) piping steel, (2) cast large end up, (3) suitable sink head with (4) air blast on charcoal and slag. This method produces an ingot of which 90 per cent is physically and chemically sound. Opportunity has also been offered for a further study of this type of ingot by the Pennsylvania Railroad, which is to have rolled into rails 100 tons of Hadfield ingots, to be studied in detail by the bureau. Arrangements are also being made to study other processes of manufacture of sound ingots, such as the compression process of Benjamin Talbot, Middlesbrough, England, and the "hot-top" ingots of the Cambria Steel Company, together with an examination of the effects of such ingredients as vanadium and titanium. It is believed that an impartial study by the bureau of the methods of manufacture of steel ingots, blooms, rails, and similar products will be helpful in stimulating an improvement in manufacturing methods and should result in more rigid specifications being enforced for those products, the use of which involves life hazard.

TEST INGOT INVESTIGATION

A matter of very great practical importance in the buying and selling of steel, involving acceptance or rejection of the material under specifications, is the determination of its analysis. The usual practice is to

take for analysis a test ingot from the ladle before casting and assume this to be a representative of the finished product. These test ingots vary greatly, however, in shape and size and quality, and it seemed desirable to endeavor to standardize this practice.

The study has been continued the past year with the co-operation of the American Society for Testing Materials. Data have been collected regarding American practice in the matter of the shape and size of such ingots, methods of sampling, etc. Seventeen of the leading steel companies have co-operated in the work by furnishing sample ingots of various grades of metal. This first series examined represents ingots poured directly; that is, without the addition of aluminum, silicon, or other substances for rendering the metal compact and free from blowholes. Later the influence of such additions will be considered.

Fifty-five ingots have been examined up to date. This examination, so far, has been entirely metallographic, including the mapping out of the regions of segregation of sulphur (as an index of the segregation in general) and the determination of the presence of the included scale, oxides, etc., in the porous metal. Careful chemical surveys of selected types will supplement and confirm this work. Up to the present the investigation seems to warrant the conclusion that shape and size of the ladle ingots are minor factors and that the investigation of the subject of additions to the metal upon pouring to render the ingot sound and free from holes is the most satisfactory solution of the problem.

This work should be extended eventually by a comparison of test ingot analysis with that of the finished products. It would appear that, at least for certain classes of materials, such as rails, the test ingot method of analysis should be rejected in favor of the analysis of the finished product.

FAILURE OF STRUCTURAL BRASSES

A comprehensive study of the causes of failure in service of structural brasses and bronzes has been undertaken by the bureau. The costly experience of the New York Board of Water Supply on its Catskill Aqueduct project, as well as the failures of bronze in the Minneapolis filter plant and elsewhere, the former of which has been widely advertised, raised the questions whether the bronzes used for such structural purposes were suitable for the purposes for which they were designed, whether the specifications were inadequate, or the methods of manufacture at fault. There appears to be a very serious lack of reliable data on which to draw up specifications for this type of material, and the ordinary tests do not usually give an indication of the true permanency of such bronzes which may easily be spoiled in manufacture. The bureau has had the co-operation of a number of brass and bronze manufacturers, who have furnished material made, as suggested by the bureau, in several ways, and the bureau has been able to obtain failed material from several sources, including the New York water board, city of Minneapolis, and the Navy Department. The relation of the presence of internal stresses to methods of manufacture and subsequent heat treatment have been carried out for numerous samples from various sources. It would appear that the presence of these internal stresses, sometimes associated with corrosion, is largely responsible for failure. It has also been shown that these stresses can be removed by annealing, without serious detriment to the physical properties. The effects of corrosion on stressed brasses is also to be studied. There is in this problem of defining the just limitations of nonferrous alloys for structural and other purposes a wide field of research.

STRUCTURAL STEEL COLUMN TESTS

An important investigation now in progress, which is of value to the engineering and architectural professions, consists of a series of column tests which the bureau is making in co-operation with the steel-column committee of the American Society of Civil Engineers and the steel-column committee of the American Railway Engineering Association.

In addition to these column investigations, a large number of steel bridge columns have been tested in co-operation with prominent engineers. The columns are facsimiles of members from long-span bridges which are being erected or soon will be erected in America. The reports on the data and results of these tests, when completed, will be very valuable to bridge designers, as such data on large size columns have not been available before.

The purpose of these tests is to determine the best forms of cross-section of columns and also to correct or confirm the formulas used by engineers and architects for calculating the strength of columns. Not alone are such formulas valuable for determining the loads which can safely be carried by the columns used in various structures, but they also enable the designer of columns to make the most economical use of the steel employed in their construction.

Although the testing of these columns consumes much time, since it must be done very carefully in order to secure reliable results, this investigation has made good progress. More than three-fourths of the two series of columns have now been tested. The results show that, with one exception, the columns made of the heavier structural shapes fail at loads per square inch of cross-section that are about 10 per cent less than those producing failure of columns of the same type but of lighter section. The work has not progressed far enough to admit of drawing any definite conclusions from the tests, and it may be necessary to again extend the present program of the investigation before arriving at a final interpretation of the results.

TESTS OF LARGE COLUMNS FOR LONG-SPAN BRIDGES

Through the co-operation of several consulting engineers and manufacturers with the Pittsburgh branch laboratory, it has been possible in the last three years to carry to completion an investigation on the strength and behavior of 18 large bridge columns when under loadings. The columns varied in size from 50 to 120 sq. in. in cross-section, and were constructed of various alloys and high-carbon steels, some of the specimens being the largest ever tested. These 18 specimens corresponded throughout with certain top chord members selected from the following long-span bridges recently erected in America: Municipal Bridge, St. Louis; Chicago, Burlington & Quincy Railroad Bridge, Metropolis, Ill., and the new bridge at Memphis, Tenn.

In carrying out this investigation a study was made of the action of the columns as a whole to determine the relation of maximum loads to yield points of the grades of steel used. The elastic coefficients of the built-up members were found and the causes of initial strain induced in fabrication by the driving of rivets were analyzed. The laws affecting the distribution of stress and strain in the lattice, pin plates, and other details were studied with reference to the efficiency of these particular types of details used by their designers.

Heretofore the inadequate capacities of American testing machines have imposed restrictions which prevented tests being made on large columns to the full maximum load at failure. Many of the present columns sustained from 3,000,000 to 6,000,000 lb. before collapse, and the derived data covering the behavior during tests will be of value to bridge and consulting engineers and manufacturers who are engaged in the construction of large railroad bridges. The research will also afford practical data for a proper formulation of the real mechanics of the column. These mechanics have in the past largely been based on purely theoretical considerations founded upon inductions made from the results gotten in the case of small laboratory specimens, there being but few systematic investigations previously made on large columns of the type here considered.

W. L. C.

The Ericsson Mfg. Company, manufacturer of telephones, Buffalo, N. Y., has received an order from the Fiat Company, Turin, Italy, for 3600 Berling magneto, which are attaining prominence abroad, due to their use on Curtiss aeroplanes and on motorcycles.

Book Reviews

Diesel Engines. By Arthur Hugh Goldingham. Pages 206, 5 x 7½ in.; figures, 135; tables, viii. Published by Spon & Chamberlain, New York City. Price, \$3.

The Diesel engine, both stationary and marine, has now become a fixture with us, and the engineering public will welcome this condensed little volume. The existing literature on the subject, including the engineering journals and the manufacturers' catalogs, have been freely consulted and used. The author has aimed to give us in concise form all useful, available information on the design, installation and operation of these machines. There is an excellent chapter on the details of construction, and the general description and illustrations of the various makes, including the leading American engines, show the sound engineering position now secured by Diesel engines. Their first cost being high has naturally interfered with their wide adoption; but where water is scarce or bad they are being installed rapidly. The thermal efficiency at full load, based on indicated horsepower running from 41 to 47 per cent, shows low operating costs even with considerable advance in cost of oil.

In marine service there are about 500 ships now operating with Diesel engines, and their reliability has been pretty well established. In this field they require less space than steam equipment, a smaller engineering force suffices, and the compactness of the fuel gives a greater operating distance for the ship. In order to appreciate this point we have only to realize that the Diesel engine takes only about 0.4 lb. of liquid fuel per brake horsepower, while the steam equipment requires nearly 2 lb. of coal. Undoubtedly they require higher-grade attendance than the steam engine, which has been operating for generations, and men of experience on Diesel engines are still rather scarce. This is probably the greatest objection to the engine, but is one that will gradually disappear as time goes on and more men become familiar with the subject. The book will be found interesting to all who are investigating this subject and should be of decided value to those who are constructing or operating the engines.

The Future of South America. By Roger W. Babson. Pages, 407, 5 x 7½ in.; illustrations, 16. Cloth. Published by Little, Brown & Co., Boston. Price \$2 net.

In view of the increasing importance of South American affairs in our daily life, this book is a timely addition to the literature that pertains to it. It is a mental journey of absorbing interest to the reader, especially so because the author views each people and nation not only with an eye to the past and the present, but with a discerning eye toward the future. It is not a descriptive book primarily, although descriptive matter enters into an analysis of natural resources. In a sense it is a business man's and investor's brief Bae-decker. It is a truly impartial book, stating disadvantages, as well as inducements, the author's own opinion and also the opinions of noteworthy South Americans. The distinctive feature is the occasional important hint that is casually thrown out to the reader showing the partiality of Pan-American institutions and consular reports for optimistic literature and the manner in which the North American and the South American are kept apart by means of garbled news inspired by those who control South American markets and newspapers.

A feature of the volume is that it is readily readable and usefully thought-provoking. Such statements as "South American revolutions do not disturb business as much as our Presidential elections," "remember that we once had this South American trade" and "our most rapidly growing cities your salesmen never visit because parlor cars do not run there" make quick reading. True to his instinct, the author tells us "I therefore urge all readers to give less attention to what people say about a country and more to its statistics." With the man who intends to develop business in South America these statistics of trade for each country, which are included at the end of the book, will be especially valuable, and the entire text

should not be overlooked by anyone studying that continent.

Automobile Repairing Made Easy. By Victor W. Page, M.E. Pages, 1056, 5½ x 8 in.; illustrations, 479. Published by the Norman W. Henley Publishing Company, 132 Nassau Street, New York City. Price \$3 net.

The book is a comprehensive practical exposition of every phase of modern automobile repairing practice and outlines every process incidental to motor car restoration. Plans for workshop construction, suggestions for its equipment, the power needed and the machinery and tools required to carry on business are given. The information presented is founded on practical experience, and the explanations are simple. Instructions for repairing all the parts of a car are given in detail and many tables and short cuts in figuring and rules of practice are given for the mechanic. Special instructions on electric starting, lighting and ignition systems are included.

This book is divided into fourteen chapters, the first two of which are given over to the repair shop and its equipment. Chapter 3 discusses the overhauling of the engine, while the next two deal with the faults of the cooling, carburetion and lubrication systems and the location and remedy of ignition faults, etc. Chapter 6 discusses motor starting and car lighting systems, with detailed descriptions of the leading ones, while the next chapter treats of clutch and gear-box faults. Faults in the chassis components are discussed in chapter 8, and the next chapter is devoted to the rear axle and driving system. The various types of wheels, rims and tires are described in chapter 10 and miscellaneous repair processes are touched upon in chapter 11. The next three chapters are given over to useful information, hints, recipes and formulae and useful mathematical and mechanical tables for mechanics.

Inventions and Patents. By Philip E. Edelman. Pages, 288, 5 x 8 in. Published by D. Van Nostrand Company, New York. Price, \$1.50.

As the author indicates, this book is intended to give a simple presentation of the subject. Valuable suggestions are given in reference to developing inventions of different classes, and the manufacturer will appreciate the treatment of systematic invention which is often of such importance in protecting and strengthening a successful business. The author also repeatedly calls attention to the importance to inventors and their associates of keeping thorough and accurate records in reference to the development of inventions.

Several chapters explain the preparation of patent applications and the relation of their different parts to the inventions to be protected. The need of clear and accurate description of the invention in the specification and related drawings is referred to, and what is of still greater importance from the practical standpoint, the preparation of the patent claims, which are the measure of the patent protection secured, and of the extent of novelty claimed for the invention. These matters are often neglected and many people who are financially interested have no better understanding of patent claims than the inventor who characterized the specification and claims of his invention as being quite a good description of the machine and then a lot of numbered short and poor descriptions, which apparently meant about the same thing and which became so tiresome that he finally gave up reading them through and signed the papers. This is natural, but it throws the work and responsibility of securing proper patent protection on an attorney who is usually much less familiar with the details and importance of the proposition than the inventor who has lived with it through the development stage, and who can often greatly strengthen his control of an industry by intelligent suggestion and criticism of patent application work.

Crushed slag for concrete as compared with trap rock has been investigated at Columbia University, and the results can undoubtedly be obtained by writing to the National Slag Company, Kinney Building, Newark, N. J.

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The Heavy Rail Imports of 1915

The spectacular exports of war steel last year cause some features of our foreign trade in iron and steel in 1915 to be overlooked. Among others is the marked increase in imports of steel rails. Statistics have been published thus far for the first ten months and these show that 73,940 tons of foreign rails had come into the country up to Oct. 31, as against only 19,981 tons in the first ten months of 1914 and the insignificant but more nearly normal total of 2738 tons for the corresponding ten months of 1913. It may be recalled that in the very opening week of 1915 the outstanding feature of the steel market was the report of sales to railroads in the United States, of rails from the Canadian mill at Sault Ste. Marie at prices from \$2 to \$3 a ton below those quoted by domestic mills. Later came a sale of 35,000 tons of open-hearth rails to the Illinois Central at \$27, Chicago, or \$3 below the bid of a Chicago district mill.

In the discussion provoked by this demonstration of the ease with which Canadian steel mills can dump their product in the United States, while effectively protected against importations from this side, attention was called to the fact that American mills, though they have maintained substantially the same base price for rails from year to year, have repeatedly given the railroads the benefit of that price when other products soared in boom times. There were no signs in the market, when these things were said, that before 1915 had half run its course another marked example would appear, of this preferential treatment of the railroads. Semi-finished steel began climbing, as is well remembered, and whereas open-hearth billets had sold at \$10 or \$11 a ton below the \$30 price of open-hearth rails in the first half of the year, they had risen to \$1 and \$2 a ton above rails on time contracts, before the year closed, and for prompt delivery were bringing \$40 and higher. In finished materials properly comparable with rails in mill cost, the advances were striking. Bars, plates and structural shapes reached 1.85c. on contract sales by the end of the year, representing \$12 a ton more than the 1.25c. price for Bessemer rails and \$10 a ton above open-hearth rails at 1.34c. Prompt sales of bars were made at 2c. and plates brought 2.50c. and in exceptional cases as high as 3c. Had the railroads paid the market price for

steel simply as steel, in the placing of their orders for 1916, and assuming that the rail mills ask current contract prices on rails yet to be placed for rolling this year, the increased cost to the railroads on, say, 3,000,000 tons of rails, would amount to \$30,000,000 to \$35,000,000.

A concrete fact of this size and significance should not be missed in the welter of theory and accusation that comes out whenever the question of rail prices comes up for discussion.

Steel Trade Conditions After the War

Never perhaps in all history have men made a greater effort to look into the future than the effort they are now making to determine what economic conditions will obtain when the great war has ended. The question is of paramount importance, and it must be accepted that efforts to forecast are rather prompted by a desire to throw light upon the subject than by confidence on the part of the forecaster that his conclusions are correct.

The steel trade's problem in this connection is a particularly important one, and it is likewise particularly difficult. There are several reasons for this. In the first place, the steel industry is practically confined to the countries at war and to the United States. Thus it has been especially affected by the war. In the second place, a very large amount of steel is being consumed in the war. If we take it that in the countries at war two-thirds of the current iron and steel output is thus consumed and that in the United States one-fourth or more of the output is destined eventually for war purposes we find that nearly one-half of the world's production at the present time is being devoted to this use. The total production of the world, however, has been diminished, and thus the consumption for all purposes other than war is very greatly reduced. In few industries of any importance has the war produced so great a dislocation. In the third place, steel is a material which passes largely into permanent works, being totally different in this respect from food and clothing, for instance. After the war the desire is to repair and reconstruct, whereby large quantities of steel would be required. But on the other hand such work involves the investment of capital rather than the spending of income, and thus at the close of the war there will be the two opposing influences, the desire to employ steel and the scarcity of capital.

One naturally inquires whether precedents may be regarded as of any use. It is commonly said that war produces high prices and that the high prices rule for some time after the war. The European war is in some aspects rather similar to our Civil War. Not until ten years after our war ended did the price of pig iron reach as low a level as the average in the three years preceding the war, but this fact must not be cited as an argument without studying details. One finds that seven years after the war ended the production of pig iron in the United States was more than three times as much as in any year preceding the war. A large demand arose not during, but after, the war. England profited by our war, making new records for production in four years of the war, 1862 to 1865 inclusive. During the next two years while the American production increased the British production decreased, and then for five years thereafter Great Britain successively made new tonnage records. The effect of war in stimulating demand may be found to be the same in the case of this war as in the case of the Civil War, but there is the important difference that the present war is consuming an enormous amount of iron and steel, the capacity to produce which has been provided or is being provided. The end of this war will lop off a vastly larger consumption than was the case with the Civil War.

The course of trade after the war will probably be dictated by two influences in succession. The first influence will be what is in men's minds, the second will be the real fundamental economic conditions. Instantly when it becomes known that peace is to be concluded, men will change their course of conduct in accordance with the views they have adopted as to what is most likely to occur upon the advent of peace. Those views will not necessarily be the views now entertained. Eight months ago the conventional view was that such prosperity as the steel trade was enjoying was created directly by "war orders" and would end with the war. Since then the direct influence of war orders has become less important, relatively. If the trend continues in this direction the scare produced by the end of the war will be correspondingly less intense. After men have acted according to their preconceived opinions the real economic conditions will begin to have their effect, gradually, producing perhaps quite an opposite movement in the course of business. The flow of manufactured goods into and out of the various countries will be determined largely by wage rates. There are those who predict high wages and those who predict low wages, in the countries now at war. One observation seems to be in point in connection with steel, and that is that there is very little room for cripples in the steel mill. In many industries the conditions of labor can be modified to make place for those whom the war will have made less than normally efficient. Wage rates in steel mills will therefore probably show a higher proportion to the general wage rate than formerly. Somewhat the same thing, however, is likely to be the case in the United States, due to the great curtailment in immigration. The condition, indeed, obtains at present, for the present wage advance in the industry is the second to occur without a correspondingly great

advance in wage rates in general throughout the country.

The uncertainties, however, do not end with the question how commodities will flow after the war. If the commodities should come to us there would still be the question whether the payment would be in commodities or in capital. The countries of Europe are spending their capital with us. What will become of this capital after the war? To the extent that we can wisely and profitably invest it, the country will be benefited in the long run, but if our manufacturing costs are high relative to those abroad there will be a forced drain that will not be to our advantage. Against the various contingencies our tariff could be properly arranged. This is one case in which wise counsel will be of signal benefit. What has developed thus far as to the intentions of some makers of national policy is not reassuring.

Labor Legislation in New York

An interesting episode in the relations of employers and labor leaders is the subject of discussion in the daily press. It appears that an agreement has been effected by the representatives of manufacturers and delegates of labor of the State of New York under which no bills affecting wages and conditions of employment are to be introduced in the State Legislature without previously being submitted to a conference of representatives of both sides. This is believed to be the first time in the history of any State that such an understanding has been reached. Labor representatives themselves are of the opinion that less misunderstanding and strife will be the result. Up to this time labor measures have been introduced in the Legislature through some friendly member and employers have either been obliged to keep a representative at the capital or have known nothing about such a bill until it has reached a stage which almost insured its passage. If hereafter bills of this kind are only introduced after a conference of representatives of both sides it is likely that labor legislation in the State of New York will be much less radical and more mindful of the interests of employers. The experiment is one which will be regarded with great interest outside as well as in the State.

Railroads Prospering at Last

Attention has several times been called in these columns to the increasing ability of railroad companies to supply themselves with needed material. These statements were based on current reports of earnings by the large systems. A striking proof of the better financial condition of railroads generally comes to hand in the issue of the *Commercial and Financial Chronicle*, New York, of Jan. 15. That journal compiles the financial reports of railroads each month. Forecasting the reports for the months of November and December, it says that, as compared with last year, the increase in earnings of all the railroads will reach \$125,000,000 in gross and \$100,000,000 in net. The *Chronicle* asks its readers to ponder well the significance of such a degree of improvement in just two months. It means a tremendous gain in the credit of the roads,

ability to borrow for new capital needs beyond anything known in recent years, and a corresponding increase and ability to enter upon comprehensive plans for the prosecution of development and improvement work. It is added that the huge expansion in revenues now taking place cannot fail to prove a stabilizing influence when the manufacturing companies are deprived of further war orders and have to return to normal conditions and content themselves once more with their regular routine business.

It is certainly to be hoped, in view of the information thus gathered by the *Chronicle*, that the railroads will be permitted to enjoy the season of prosperity now on them and that they will have an opportunity to accumulate a comfortable surplus to carry them through the lean years which are sure to come. It is not likely that such exceptionally prosperous conditions will long prevail. The railroads have certainly been harassed sufficiently by National and State authorities and by labor agitators and they should now be left free to fatten their treasuries, not only for their own benefit but for the good of the entire country.

Restricting Fabrication in Transit

WASHINGTON, D. C., Jan. 18, 1916.—The Interstate Commerce Commission has rendered a decision justifying the schedules recently filed by the Erie Railroad and Chicago & Erie Railroad companies restricting fabrication-in-transit service at Rochester, Ind., and Greenville, Pa., to fourteen iron and steel articles fabricated there into "framework or sections for bridges or buildings." These schedules were suspended upon protest filed by the Chicago Bridge & Iron Works of Chicago, which has a plant at Greenville. Fabrication in transit is accorded on the lines of the railroads involved in this case at Rochester and Greenville, but since the service was established at Rochester in 1909, the arrangement has applied exclusively to bridge and building material, and no protest is made by industries at Rochester to the operation of the schedules under suspension. In 1910 the protestant established a plant at Greenville, Pa., ninety-one miles northeast of Pittsburgh to develop its business in water tanks and structural steel throughout the eastern section of the country, and the carriers published a tariff according fabrication-in-transit service at that point. The protestant receives iron and steel articles at Greenville from Pittsburgh, fabricates them into tower and tank material and forwards them at the remainder of the through rate from point of origin to destination, plus the prescribed charge of 1½c. per 100 lb. for the service. The commission had previously held that it would be inadvisable to extend the fabrication-in-transit service to structures other than bridges or buildings, and the action of the railroad is now confirmed as in line with that decision. The Greenville combinations of rates on shipments to Eastern markets are from 3.7c. to 7.3c. higher than the present joint rates.

Apollo Electric Steel Company

At Apollo, Pa., the Apollo Electric Steel Company is being organized with a capital of \$500,000. It is stated that the company has secured an option on about 8 acres of ground, on which it proposes to erect a plant to contain two Snyder electric steel furnaces. It is also stated that only \$400,000 of stock will be issued at this time and that \$230,000 has already been subscribed. The company intends to make alloy and tool steels. Identified with it are Robert Lock, president and general manager Apollo Steel Company; J. Arthur White, Pittsburgh; W. E. Troutman, manager of the Vandergrift plant of the United Engineering & Foundry Company, and Carl H. Booth, vice-president Snyder Electric Furnace Company, Chicago.

The Foreign Trade Convention at New Orleans

The prospects are that the third annual convention under the auspices of the National Foreign Trade Council, which will be held at Hotel Grunewald, New Orleans, Jan. 27 to 29, will be largely attended. Naturally home and foreign conditions after the close of the war will be a prominent topic of discussion. At the opening session Thursday morning, Jan. 27, Alba B. Johnson, president Baldwin Locomotive Works, Philadelphia, will speak on "World Trade Conditions After the European War," and President Farrell of the Steel Corporation, who is chairman of the National Foreign Trade Council, will speak on "Foreign Investments of American Capital as an Aid to Our Foreign Trade." Willard Straight, vice-president American International Corporation, New York, will make an address on the "Relation of the Tariff to World Trade Conditions After the War." In the same line will be the address of Prof. Henry C. Emery, formerly chairman of the United States Tariff Board, on the "Necessity for an Anti-Dumping Law." One of the group sessions will consider the "United States Tariff System and Foreign Trade" and other important topics will come before the group meetings. The merchant marine will be one of the topics of Friday morning and the question of co-operation in the export trade will be discussed by M. A. Oudin of the General Electric Company, Schenectady, and others.

At the banquet, Friday night, Chairman Davies of the Federal Trade Commission will discuss "Co-operation in Foreign Trade"; Frank A. Vanderlip will speak on "Some Elements of National Foreign Trade Policy" and Fairfax Harrison, president Southern Railway Company, on the "Relation of American Railroads to the Development of Foreign Trade."

Eastern delegates for the most part will go to New Orleans by the Foreign Trade Special over the Pennsylvania and Southern lines, leaving New York at 4:35 p. m., Tuesday, Jan. 25.

Scrap Rates for Remelting Material Only

WASHINGTON, D. C., Jan. 18, 1916.—The Interstate Commerce Commission is developing a policy with respect to the classification of scrap iron and steel for rating purposes which should command the attention of all manufacturers and shippers in the industry. The latest decision has just been rendered in the case of the Watrous-Acme Mfg. Company vs. Pere Marquette Railroad Company. The complainant is engaged in the manufacture of light hardware at Des Moines, Iowa, and in April, 1915, filed a complaint alleging that the rate of 29c. per 100 lb. charged for the transportation of three carloads of "scrap iron" from Flint, Mich., to Des Moines was unreasonable to the extent that it exceeded the rate of 22c. per 100 lb. applicable to scrap. The evidence showed that the shipments consisted of pieces of steel left after automobile bodies had been cut from the original steel sheets. They cost complainant \$11.75 per ton. The original sheets were worth \$60 per ton. About two-thirds of the material shipped was used in the manufacture of metal centers for oil mops and also apparently for other articles. The remainder complainant sold for remelting, at prices ranging from \$4 to \$7 per ton. The commission found against the shipper, holding that rates on scrap iron or steel applied solely to material useful only for remelting.

The Charcoal Iron Company of America, Detroit, Mich., entertained in that city Jan. 14 the representatives of the nine offices of its selling agents, Rogers, Brown & Co., and members of that firm. Among those present were W. A. Rogers, M. C. Armour, A. A. Fowler, W. T. Shepard, E. L. Billingsley and J. K. Pollock. The visitors were guests at a luncheon served at the Pontchartrain Hotel at noon and at a banquet at the Detroit Club followed by a theater party in the evening. A business session was held during the afternoon.

Government Plan to Equip Private Plants

A Proposal Under Which Munitions Could Be Quickly Turned Out if the Emergency Came—Country-Wide Mobilizing of Industry

WASHINGTON, D. C., Jan. 18, 1916.—A comprehensive project for the mobilization of the industries of the country engaged in the production of war material and the development and maintenance by private concerns of equipment designed for the manufacture of articles of the special types required for the United States Army has been formulated by the Secretary of War. The first steps have been decided upon and are being urged upon the attention of the appropriate committees of Congress by Secretary Garrison in connection with the development of the Administration's program for the improvement of the national defense.

Provisions of existing law operate effectively to prevent the War Department from taking any steps calculated to secure the co-operation of manufacturers in building up and preserving a large potential capacity with which to meet emergencies. There is, first, a prohibition against the purchase of more than a negligible quantity of war material, and second, a stipulation that contracts must in all cases be awarded to the lowest bidder. In the army appropriation act, for example, it is provided that not more than \$100,000 of the \$2,900,000 appropriated for the manufacture of reserve ammunition for field artillery, etc., may be used in the purchase of such ammunition and that not more than \$170,000 of the \$2,090,000 appropriated for the manufacture of field artillery material may be used for the purchase of such material.

Many private manufacturers stand ready to spend large sums for the special equipment of their plants to meet the requirements of the Government if they can be assured that orders would be placed with them should the War Department in any crisis require large supplies of ammunition, arms, etc., on short notice. The officials of the War Department are keenly appreciative of the attitude of these manufacturers and have been much gratified at the assurances they have received, but heretofore they have not been in a position to accept any of the numerous offers, which, in the opinion of Government experts, would redound greatly to the advantage of the military establishment.

APPROPRIATIONS FOR PRIVATE PLANTS

After numerous conferences between Secretary Garrison, General Crozier, chief of ordnance, and other army officers of experience, it has been decided to urge upon Congress a legislative program that will put the War Department in position to utilize the services of private manufacturers who are willing to co-operate with the Government. The Secretary and General Crozier will urge the incorporation in each of the army and fortifications appropriation bills of the following:

Provided, that of the sums appropriated in this act for material to be procured by the Ordnance Department not to exceed 25 per cent may be expended in such manner as, in the judgment of the Secretary of War, may be suitable for rendering quickly available to meet the needs of the United States, the manufacturing capacity of private plants, and provided further, that in making such expenditures the existing laws prescribing competition in the procurement of supplies by purchase shall not govern.

It will be noted that the language of the proposed law is so broad as to enable the Secretary to go so far as to purchase the equipment for the use of private plants or to provide for the preservation of such equipment pending a demand for its use. The Ordnance Bureau would be at liberty to cause special machinery to be built at private plants and carefully laid up for storage when not actually in use, the title to the equipment to be in the Government or in the private manufacturer as the equities of the particular case might dictate.

There has been considerable discussion among the

ordnance experts of the desirability of equipping a few advantageously located plants for the manufacture of rifles, machine guns, field artillery, etc., of United States army types. The production of a complete set of patterns, gages and automatics for the manufacture of the service rifle would occupy a well equipped factory six or eight months and would cost a considerable sum. Obviously such a delay in case of a serious emergency would prevent the utilization of private plants in time to be of maximum service. It is also unreasonable to suppose that any private manufacturer would be willing to provide the necessary tools, gages, etc., for the manufacture of the army rifle under the existing state of the law which limits the authority of the Secretary of War to purchase material to a negligible percentage of the department's requirements.

The removal of the restriction which now requires competition on all Government purchases is regarded by the War Department officials as a very important feature of this proposed legislation. Congressmen boast of their determination to "treat everybody alike" and to "put the small manufacturer on an equal footing with his big competitor," etc., etc. These very laudable general principles have been carried to such an extreme, however, that the Government is frequently obliged to let contracts against its own interests. It is Secretary Garrison's idea that all considerations should be subordinated to the best interests of the Government in the expenditure of the appropriations which it is proposed shall be disbursed in the discretion of the Secretary of War.

CONDITIONS OF GOVERNMENT CO-OPERATION

Many elements other than price—although it may be assumed that the interests of the Government would be fully safeguarded against extortion—would enter into contracts made by the Secretary of War for the equipment of private plants to manufacture war material. It would be a first essential, of course, that the plants undertaking this work should be of the highest financial and professional responsibility. Guarantees would also have to be exacted that the contractors would hold themselves in readiness at any time to respond to calls by the Government without regard to any other engagements, present or prospective. This might involve the carrying of considerable quantities of available equipment in idleness for indefinite periods but, of course, this would be an essential feature of the arrangement.

It is obvious that the development of this broad scheme devised by Secretary Garrison and General Crozier will depend solely upon the action of Congress. As the result of the canvass of munitions plants recently made by the Ordnance Bureau on the basis of drawings and schedules published in *THE IRON AGE* several months ago, a vast amount of valuable information has been gathered, which, supplemented by special inquiry, will make it a comparatively easy task for the department officials to expend wisely any moneys that may be appropriated by Congress.

W. L. C.

The annual report of the Wisconsin Free Employment Bureau at Milwaukee, operated by the Industrial Commission of Wisconsin, shows that there was an increase of 25 per cent in calls for help in 1915 compared with the previous year. There was a decrease of 10 per cent in applications for work. A large part of the increase in calls for help is attributed to the demand from metalworking shops. It is stated that the number of machinists now at work compared with a year ago is about double.

AGAINST THE TAYLOR SYSTEM

Plants Making Munitions for the Government Aimed at by Labor

WASHINGTON, D. C., Jan. 18, 1916.—The Congressional allies of the leaders of organized labor have decided upon the program they will pursue in the effort to bring about the prohibition of scientific shop management in all the manufacturing establishments of the Government. Readers of THE IRON AGE are familiar with the circumstances under which the use of the Taylor system in the arsenals was prohibited or restricted as the result of the incorporation of the so-called Dietrick amendment to the army and navy appropriation bills enacted by Congress last February. Either by inadvertence or because the labor leaders regarded it as inadvisable to deprive the skilled workmen at the arsenals of the opportunity to earn premiums, Representative Dietrick did not urge his amendment as an addition to the fortifications appropriation bill under which the greater part of the manufacturing at the arsenals is carried on; hence scientific shop management systems have been pursued and are now being pursued at the Watertown, Mass., arsenal, while at the Frankford, Pa., arsenal a large amount of work has been changed over from time to piece rates so that premiums are still earned.

Representative Tavener of Illinois, who was one of the active leaders in this movement in the last Congress, has introduced a bill "to regulate the method of directing the work of Government employees," which it is claimed has the indorsement of all the pro-labor leaders of the House. The argument against the use of scientific shop management systems in Government institutions is set forth in the preamble to the measure, the text of which is as follows:

Whereas, Certain executive departments are installing in their respective establishments new systems of shop management, known by the generic term of "scientific management," which have for their purpose the attainment of the maximum efficiency from both plant and workmen; and

Whereas, A stop watch is used in timing workmen while at work to ascertain the maximum amount of work possible for the most capable man in a given time and making this the "standard time" in which work must be done, and by a system of premiums and bonuses, together with disciplinary measures sufficiently severe to enforce the system, this "standard time" is the speed to which all workmen must eventually attain if they are to retain their employment; and

Whereas, Experience has shown that the American workman by his exceptional celerity performs about twice the work performed by the manual worker of other countries, with the concomitant condition that the ratio of accidents here is from three to four times as high as in other countries; and the tendency of so-called "scientific management" through the above timing and bonus features will be to further aggravate the accident disabilities and mortality aforesaid and reduce the workman to a mere mechanical, instead of social and moral, relation to his work, and, moreover, are unnecessary to secure adequate efficiency of labor; and

Whereas, By a stop-watch time study you may be able to determine the time in which a piece of work can be done, but you do not thereby determine the time in which it ought to be done; therefore

Be it enacted, That it shall be unlawful for any officer, manager, superintendent, foreman, or other person having charge of the work of any employee of the United States Government to make or cause to be made with a stop watch or other time-measuring device a time study of any job of any such employee between the starting and completion thereof, or of the movements of any such employee while engaged upon such work. No premiums or bonus or cash reward shall be paid to any employee in addition to his regular wages, except for suggestions resulting in improvement or economy in the operation of any Government plant.

Sec. 2. That any violations of the provisions of this act shall be deemed a misdemeanor and shall be punished by a fine of not more than \$500, or by imprisonment of not more than six months, at the discretion of the court.

In presenting this measure in the form of a sweeping prohibition covering all departments of the Government, the labor leaders have adopted a shrewd device intended not only to render the legislation comprehensive but easy of enactment. Any prohibition directed

against the work done under the fortifications appropriation act would have had to run the gauntlet of the appropriation committees, the members of which, presumably, regard it as their first duty to conserve the interests of the Government. In the form in which the Tavener bill has been drawn, however, it has been referred, under the rules of the House, to the Committee on Labor, which is regarded, by its members at least, as the special organ of the workingman in the House of Representatives. There can be no doubt that this committee will speedily report the bill and urge its passage.

That these are shrewd tactics goes without saying, especially as this method of handling the matter obviates the necessity of appearing to antagonize the national defense bills at a time when public sentiment in their behalf is generally aroused. If the Tavener bill becomes a law the next step of the labor leaders will be to secure the enactment of a provision prohibiting the letting of Government contracts to manufacturers in whose plants scientific shop systems are employed. It remains to be seen, therefore, whether the private manufacturers of the country will take sufficient interest in this important controversy, before the Tavener bill is brought to a vote, to acquaint their representatives and senators with the fact that there are two sides to the question.

W. L. C.

Engineering Societies to Canvass Industries for the Government

W. L. Saunders, chairman of the Ingersoll-Rand Company, who is president of the American Institute of Mining Engineers and vice-chairman of the Naval Consulting Board, has given out a letter addressed to him by President Wilson, referring to a new step in mobilizing the industries of the country in the interest of preparedness. President Wilson asks that the American Institute of Mining Engineers appoint one of its members in each of the forty-eight States to act in conjunction with a similar number of representatives of the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers and the American Chemical Society in collecting for the Naval Consulting Board data as to manufacturing plants that could be turned to the Government service in case of emergency. The plan as explained by Mr. Saunders would mean the appointment of 240 persons. As a test preparatory to the canvass of the entire country, Mr. Saunders and others recently made a census of the industries of New Jersey. It was found that there are 800 firms in that State manufacturing products which the Government would need in the event of war. The organization of engineers thus proposed by the President is his substitute for the industrial commission which he recently asked Congress to create. The members of the board of 240 will serve without remuneration and the data will be collected and catalogued without expense to the Government.

Ferromanganese Freight Rates Advanced

WASHINGTON, D. C., Jan. 18, 1916.—Increased freight rates on ferromanganese to Western points are justified by the Interstate Commerce Commission because of the marked advance in the price of this product, which is attributed to the European war. Leading trunk lines recently filed tariffs canceling joint import carload commodity rates on ferromanganese from Eastern ports to points in central freight association territory. The import rates per gross ton from Baltimore, Md., have been: \$2.64 to Youngstown, \$3.18 to Detroit, \$3.62 to Portsmouth, \$2.30 to Pittsburgh. The rates which are now applicable on domestic traffic are: \$2.92 to Youngstown, \$3.50 to Detroit, \$3.98 to Portsmouth, \$2.46 to Pittsburgh. The evidence showed that before the European war the price of ferromanganese ranged from \$35 to \$55 per ton, while it is now worth upward of \$100. As a result of a hearing the commission found that the cancellation of the import carload commodity rates was justified.

Benzol Production at Coke Plants

A new industry, the recovery of benzol and toluol, suddenly sprang into existence in the United States in 1915, as a result of an unprecedented demand for high explosives. Before the European war the demand for these products was so small and the price so low that but one company, engaged in coke-making, sought to recover them on a large scale. Late in 1914 the price of benzol and particularly toluol rose so high that many other companies began building plants for the recovery of these oils which were then being burned with the coke-oven gas. By the end of 1915 there were 19 new plants for benzol recovery in operation and others in course of construction, most of them in connection with steel plants.

Reports made to C. E. Lesher, of the U. S. Geological Survey, by all of the by-product coke plants in the country, indicate that the output of benzol and other light oils in 1915 amounted to 13,942,763 gallons, in connection with which there was produced 761,256 lb. of naphthaline, a solid crystalline substance. Some of the benzol-recovery plants were in operation at the beginning of the year, but many were built during the early months of 1915 under contracts calling for great speed in erection. Several of the plants are not equipped to separate the different oils found in the crude, and 7,322,670 gallons, more than half of the total output, was reported as crude benzol and light oil and was shipped in tank cars to refineries connected with powder works and other chemical industries. In the 6,620,093 gallons of oils refined at the place of recovery, there were 4,833,939 gallons of 100 per cent benzol, 1,315,727 gallons of toluol, and 470,425 gallons of solvent naphtha.

Thirty-one coke-making establishments with 4933 by-product ovens contributed to this total, and it is estimated that between 8,000,000 and 9,000,000 tons of coal were carbonized in the ovens that furnished the gas from which the oils were recovered. The annual capacity of the benzol-recovery plants now in operation is estimated at over 20,000,000 gallons, and with the completion of plants now building will probably exceed 22,000,000 gallons.

The value of these products is indicated by the prices currently reported in the past year. Benzol, normally selling for 20c. or less a gallon, in September brought as high as \$1.25 for immediate shipment and 65c. on contract; toluol, with a normal price of 25c., was sold for as much as \$6 a gallon for immediate delivery and was contracted for at \$4.25 per gallon.

Benzol is an excellent motor fuel and has had a considerable use in that way in Great Britain and Germany. The United States, whose output of gasoline is estimated in 1914 at 30 to 50 million barrels (1,500,000,000 to 2,500,000,000 gallons), stands in no need of additional supplies for this purpose. There is, however, in the United States in normal times a large use for dyes and chemicals, such as carbolic acid, which depend upon benzol and toluol for raw material and which have in the past been largely imported from Germany either as finished or as intermediate products.

After the war demand for explosives is over and the price of benzol returns to normal, serious effort will of course be made to find a market for this product. Shut off from European competition, the dye and chemical industry in the United States is now making rapid strides forward. If this industry after the close of the war is able to hold its own against the highly developed foreign competition it may completely absorb the output of benzol and add another source of income to the coke-oven plants.

The bulletin on "The Production of Iron and Steel in Canada in 1914," by John McLeish of the Canadian Department of Mines, places the total pig-iron production in 1914 at 699,256 gross tons and the output of steel ingots and castings at 814,415 tons. These figures differ slightly from those given out by the American Iron and Steel Institute and published in THE IRON AGE, Aug. 12, 1915. This report placed the Canadian pig-iron 1914 production at 705,972 tons and the steel output at 694,447 tons.

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PERSONAL

Jacob D. Waddell, who recently resigned as general manager of sales of the Brier Hill Steel Company, Youngstown, Ohio, was tendered a farewell dinner at the Youngstown Club by his former associates. Paul W. Hubbard, his successor as general manager of sales, was toastmaster, and in behalf of those present gave Mr. Waddell a desk set of hand worked wrought iron.

George F. Hocker, chief clerk in the steel foundry department of the Pennsylvania Steel Company, Steelton, Pa., has been made a special salesman of steel foundry products. He will be connected with the Philadelphia office but will maintain an office at the plant.

Adam Vogt, secretary and treasurer, Henry Vogt Machine Company, Louisville, Ky., has disposed of his holdings and will retire from active management Feb. 1. Henry Vogt, his brother, who is president of the company, has taken over most of the stock. The retiring officer has large real estate interests in Louisville, and it is understood that they will hereafter receive most of his attention.

Edward S. Jordan, secretary and general sales manager, Thomas B. Jeffery Company, Kenosha, Wis., has resigned. He is reported to have organized a new automobile manufacturing company to have headquarters in Detroit. Paul Zens, purchasing agent, has also resigned to become associated with Mr. Jordan.

Frank K. Bull, president J. I. Case Threshing Machine Company, Racine, Wis., for many years, was elected chairman of the board of directors at a special meeting held Jan. 12. The position has just been created. Warren J. Davis, treasurer, was elected president to succeed Mr. Bull, and also continues as treasurer.

On account of ill health, William Hermann, president Fosdick Machine Tool Company, Cincinnati, Ohio, has retired from the active management. He will be succeeded by Norman B. Chase, formerly general superintendent of the Cincinnati Shaper Company, whose title will be vice-president and general manager.

Edward Kountz, formerly general foreman of the Cincinnati Shaper Company, Cincinnati, Ohio, has been appointed acting superintendent, succeeding Norman B. Chase, who resigned to take charge of the Fosdick Machine Tool Company, Cincinnati.

Edward Swanson of the Commonwealth Steel Company, Granite City, Ill., has been elected president of the Granite City Commercial Club, which is composed of all the leading local business men.

George E. Dix, manager of sales of the Central Steel Company, Massillon, Ohio, has resigned, effective Jan. 15 to accept a position with the Worth Bros. Company, Widener Building, Philadelphia.

Dr. John A. Mathews, president Halcomb Steel Company, Syracuse, N. Y., addressed the Chicago section of the American Institute of Mining Engineers, Friday evening, Jan. 14, on "Iron in Antiquity and To-day."

E. C. Waldvogel, who has been connected with the Yale & Towne Mfg. Company for the past eleven years, first as traveling salesman and later as sales manager and assistant general manager, has just been appointed general manager. His work will include general supervision of all sales, domestic, Canadian and export.

William F. Montavon and Prof. Philip B. Kennedy have been appointed United States commercial attachés, the former at Lima, Peru, and the latter at Melbourne, Australia. Mr. Montavon has been identified for several years with the movement to introduce household industries on a commercial scale in the Philippines. Professor Kennedy has been director of the day division of the School of Commerce, Accounts and Finance of New York University.

The Lovell-McConnell Mfg. Company, Newark, N. J., announces that at its annual stockholders' meeting Walter P. Coghlan was elected a director, and at the

directors' meeting was made secretary of the company. He will also continue as general sales manager.

Maynard D. Church has been appointed chief engineer of the Terry Steam Turbine Company, Hartford, Conn.

Charles M. Schwab gives a dinner to the Carnegie Veterans at his residence in New York, Friday evening, Jan. 21.

B. F. Jones, Jr., president Jones & Laughlin Steel Company, Pittsburgh, has been elected a director of the Union Trust Company of that city, succeeding W. N. Frew, deceased.

The J. C. Russell Shovel Company, Magee Building, Pittsburgh, has appointed R. L. Mason, 1501 Oliver Building, that city, to act as its special representative in the railroad field. He was connected with Hubbard & Co., Pittsburgh, for fourteen years.

Frank B. Baird, president Buffalo Union Furnace Company, was unanimously elected president Buffalo Chamber of Commerce Tuesday, Jan. 18.

Railroad Car Business

The most interesting development is the quiet purchase by the Pennsylvania Railroad of 5000 cars, though whether much, if any, more was paid for the cars at this time than when, about two months ago, bids were rejected is not definitely known. The reported re-entry into the market by the Illinois Central, which also withdrew some weeks ago after learning of car costs, has not as yet taken definite shape, but the consensus of opinion is that neither road gained anything by deferring purchases.

With the Union and Southern Pacific systems in the market, there are all of 12,000 cars under more or less active consideration. The Cambria Steel Company closed for 3000 of the Pennsylvania's cars and the Ralston Steel Car Company for 2000. Besides the 500 cars for the Lehigh Valley reported last week, 500 each were placed with the American Car & Foundry Company and the Standard Steel Car Company.

Freight Embargo Removed

The Pennsylvania Railroad has removed practically all of the restrictions it has had in effect on accepting for shipment freight for export. The restrictions which still remain are as follows: Export freight, flour, cotton and lumber. Domestic freight, hay, straw and empty barrels. It is certain that it will be necessary to impose the restrictions again if shippers fail to co-operate with the railroad by offering for transportation only such freight as can be disposed of promptly upon its arrival in the New York district.

Volume of Fabricated Work Closed in December

The capacity of the bridge and structural shops of the country was put under contract in December to the extent of 121 per cent of the capacity of the plants, according to the records of the Bridge Builders and Structural Society, collected by its secretary, George E. Gifford. This makes the average for the twelve months of 1915 72 per cent of the capacity of all the shops, which is 14 per cent on the average better than either 1913 or 1914 and over 10 per cent better than 1912.

The National Association of Waste Material Dealers will remove its headquarters about Jan. 24 from 170 Summer Street, Boston, to 185 Summer Street. The new headquarters will consist of a suite of offices on the top floor of what is known as the Brown Building, and have been equipped with all the conveniences that members could require.

Iron-ore exports from Sweden in the first 10 months of 1915 were 5,492,000 metric tons, against 4,191,000 tons to Nov. 1, 1914, a gain of 1,301,000 tons. In October alone these exports were 689,000 tons against 336,000 tons in October, 1914. The increases are probably due to the unusual shipments to Germany.

OBITUARY

Austin D. Mixsell

Austin D. Mixsell, vice-president of the Bethlehem Steel Company, died at South Bethlehem, Pa., Jan. 15, after an illness of a few days, aged 42 years. He was one of the best-known men in the commercial side of the Eastern steel trade, though as with other of the more successful sales representatives of the industry, his early experience was in the works. He entered the employ of the Bethlehem Steel Company in 1897 in the



AUSTIN DAVIS MIXSELL

office of the metallurgical engineer. For the following nine years he was in the manufacturing department, working in the yards at open-hearth furnaces, rolling mills, forge and machine shops and in the laboratories and inspection bureaus. From 1904 to 1906 he was in charge of the estimating department. In the fall of 1906, after several months in the sales department, he was appointed sales agent in New York, and in 1908 was made sales manager of the company at South Bethlehem, having charge of the sales of steel products for the general market. In June, 1915, Mr. Mixsell was elected a vice-president of the company and since that time had been engaged with President E. G. Grace in its general affairs. He was a member of the American Iron and Steel Institute, the American Society of Mechanical Engineers and the Engineers' Club, New York.

B. E. SPERRY, president of D. R. Sperry & Co., Batavia, Ill., died Jan. 5, after a short illness, aged 63 years. He had been associated with the company since he was eighteen, and had filled the position of president for nearly a quarter of a century. Under his management the business of the company grew threefold. He was the inventor of the Sperry filter press, the Sperry filter plate, and the switch cock and double gutter system of filtration. Another of his inventions consists of the Sperry swing kettle vacuum pan, an ingenious and convenient type of machine found in many branches of the chemical industry. Due to his efforts a complete line of caldrons suitable for farm and industrial uses was developed. He was born in Malone, N. Y., and leaves his widow, five daughters and one son.

J. F. CONRADI, supervising engineer, Maxim Munitions Company, New Haven, Conn., died Jan. 12, in New York City, from pneumonia. He was a munitions

engineer of note and had for many years been with the Maxim-Vickers Company of England.

GRAHAM FRASER, for many years prominent in the Nova Scotia Steel & Coal Company, New Glasgow, Nova Scotia, died in that city Dec. 25, aged 69 years. His father, Thomas Fraser, was known widely as a shipbuilder in the days of wooden ships. Graham Fraser devoted his energies to iron and steel. He was connected with the Nova Scotia Steel & Coal Company in its beginnings, when it operated a forge at New Glasgow, and was active in the later developments out of which grew a corporation employing several thousand men. He retired from active business a few years ago.

ASA S. COOK, president and treasurer Asa S. Cook Company, Hartford, Conn., died Jan. 18, from pneumonia, aged 93 years. He was born in Sandwich, N. H., and went to Hartford in 1850 to work for the Colt's Patent Fire Arms Mfg. Company. He became interested in the manufacture of wood screws and invented several machines for their manufacture. In 1858 he established his own business for the manufacture of wood screw machinery and in 1896 incorporated the business as the Asa S. Cook Company.

DAVID ADAMS died at Sharon, Pa., Jan. 5, aged 76 years. He was treasurer of the Sharon Iron Company, Ltd., in the 1890's, and on the formation of the Sharon Steel Company by the same interests—F. H. Buhl and others—was elected secretary and treasurer, maintaining this connection until the absorption of the company by the United States Steel Corporation. He had been a member of the Sharon school board for thirty-five years and for the past eighteen years had been its president.

DR. EMIL HOLZ, formerly managing director of the large steel works at Witkowitz, Austria, and an authority on mining and steel metallurgy, died recently in Berlin, Germany. He was a member of the boards of the Westphalian Steel Works and the Donnersmark Spelter Works.

WILLIAM H. GREGG, who for many years operated the Broadway Foundry & Machine Shop, St. Louis, Mo., and was afterward in the white lead and paint business, died in that city Jan. 12, aged 85 years. He leaves two sons and three daughters.

SAMUEL G. WINTERNITZ, a retired iron merchant, died at his home in Baltimore, Dec. 30, from heart failure. He was born at Vienna 77 years ago and had been a resident of Baltimore for 74 years. About 15 years ago he retired from active business.

CHARLES R. JOHNSON, Sr., owner of the Johnson Foundry & Machine Shop, Madison, Ind., died Jan. 13, aged 66 years. He leaves his widow and three children. He established the street railroad and electric light systems in Madison.

ALLEN S. BAKER, president and treasurer, Baker Mfg. Company, Evansville, Wis., died Jan. 10, aged 74 years. He is credited with having been the first manufacturer to institute a system of profit-sharing with employees.

GEORGE W. TODD, formerly president of the Diamond State Iron Company, died in Wilmington, Del., Jan. 11, of pneumonia. He was at the head of the company when it was purchased by the Diamond State Steel Company.

D. S. BENEDICT, for the last six years associated with Hickman, Williams & Co., in their Chicago office, died suddenly last week from pneumonia. He had been ill only three days.

HENRY M. GEIS, salesman for the Brown & Sharpe Mfg. Co. from its Chicago store, died at his home in Maywood, Ill., Dec. 21, aged 35 years. He leaves his widow and a son.

STEPHEN A. ASHMAN, founder and for many years head of the S. A. Ashman & Son Company, Philadelphia, Pa., died Dec. 22, aged 82 years. He started the business in 1873.

GEORGE R. RAY, founder and president of the Manistee Iron Works, Manistee, Mich., died last week after a protracted illness, aged 76 years.

Iron and Steel Markets

DELIVERIES GROW WORSE

Further Advances in Contract Prices

Some Restriction of Metal-Working Operations by Scarcity of Steel

The delivery troubles with which buyers of steel have contended for weeks are now more aggravated than at any time, and this condition dominates the whole steel situation. New business has been quite secondary since the opening of the year.

Moreover, mill output has been somewhat reduced by the roll changes necessary in the holding up of export and New England business, and cold weather has had its effect also.

While the Pennsylvania Railroad has relaxed the embargo on export steel products at Pittsburgh so that shipments are made of anything for which vessel room has been provided, the New England embargo continues and the situation there gives manufacturers much concern. Many metal-working plants are operating only from day to day and all are depleting their stocks, with the probability in some cases that matters will be worse before they are better.

While Central Western shops which work up rolled products are getting more steel because parts of New England can get none, there is still a limitation of output at a number of plants because the mills cannot supply all the raw material wanted. Actual shut-downs are few, but the lack of plates has caused intermittent operation in a few cases.

Our Chicago report cites the case of an implement company which planned to produce 24,000 machines but has had to cut the number to 18,000 because sufficient material could not be bought. Instances like this are an offset to all that is said about high prices curtailing consumption.

In structural lines particularly, steel at \$12 to \$15 a ton more than was paid in the spring of 1915 may be expected to restrict building operations in the coming season. Yet in December the fabricating companies booked orders representing 121 per cent of a month's capacity. Manufacturing additions in the steel and munitions industries account for much new structural work; in ordinary building lines in New York and elsewhere there is complaint that not enough is coming up.

Steel companies may be quoting higher prices to hold back business for the second half; but the fact is that from the advance to 1.85c., Pittsburgh, only recently made, one large producer has now gone to 1.90c. on bars and shapes for third and fourth quarter delivery. For vessel plates for that delivery 2c. is asked.

Lake shipyards have taken some contracts on which deliveries cannot be made before 1917. Four Norwegian boats have just been placed with the leading Lake builder and two vessels with a Pacific Coast yard. Other work is in sight, including two

large vessels for the Cuban ore trade. No end can be seen to the full operation of all shipyards.

Railroads are giving out car orders which recently were withheld because prices were considered too high. The Pennsylvania Railroad has just ordered 5000 cars of the cars it once withdrew and in all about 12,000 cars are now actively before the market.

Late rail sales include 30,000 tons to the St. Paul, 6000 tons to the Pittsburgh & Lake Erie and 4000 tons to India, with 2000 tons for Portuguese East Africa practically closed. A new inquiry for Russia is for 60,000 tons.

In war steel bars, a 30,000-ton sale for delivery after July has been made to the Allies' agents. On shrapnel bars such contracts can still be put through at 3c. for they make desirable rollings. On large steel stock 3½c. and higher is asked. For France about 500,000 tons will be taken at suitable prices for deliveries running into next year.

A notable development is that warehouse prices, which one interest has decided to hold at 2.50c. for bars, plates and shapes, are lower than some mills have asked on prompt deliveries. The disparity is most marked in plates, which have sold up to 2.75c. and 3c., Pittsburgh, from mill.

The pig-iron market has been less active, but producers' policy is evidently based on the expectation of further advances. At Buffalo a sale of 70,000 tons of hot metal for the second half has been made.

In Southern iron there is some irregularity due to the offering of resale iron and in the Central West to selling by one producer on a \$14.50, Birmingham, basis. In the Chicago district, with Northern iron selling at a price corresponding to \$15, Birmingham, Southern sellers generally ask 50c. higher.

That ferromanganese imports are running steadily below the rate necessary to cope with a 40,000,000-ton ingot production, without a marked increase in domestic production, has long been evident and prices advancing beyond \$125 indicate more fear of a shortage.

Pittsburgh

PITTSBURGH, PA., Jan. 18, 1916.

The Pennsylvania Railroad has made official announcement that the embargo on export iron and steel shipments has been removed under certain conditions. This will help out to some extent on delivery of foreign orders but the embargo to New England points is still on, practically no shipments of iron and steel products being accepted by the railroads at present for such delivery. Conditions in the local steel trade since Jan. 1 have been remarkably quiet, but there are no signs of any easing up in prices. The mills are sold up for three or four months, and the demands on them for deliveries are as insistent as ever. All labor troubles in the Youngstown district are over, and the plants that were closed are again running. It is believed that, while January and February may be dull in point of new buying, early in March consumers will come in the market to cover their needs for second and third quarters.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Jan. 19,	Jan. 12,	Dec. 22,	Jan. 20,
Pig Iron, Per Gross Ton:	1916.	1916.	1915.	1915.
No. 2 X, Philadelphia . . .	\$20.00	\$20.00	\$19.50	\$14.25
No. 2, Valley furnace . . .	18.50	18.50	18.50	13.00
No. 2 Southern, Cin'ti . . .	17.90	17.90	17.40	12.40
No. 2, Birmingham, Ala. . .	15.00	15.00	14.50	9.50
No. 2, furnace, Chicago* . .	18.50	18.50	18.00	13.00
Basic, del'd, eastern Pa. . .	19.50	19.50	18.50	13.50
Basic, Valley furnace . . .	17.75	17.75	18.00	12.50
Bessemer, Pittsburgh . . .	21.45	21.45	19.95	14.55
Malleable Bess., Ch'go* . .	19.00	19.00	18.50	13.00
Gray forge, Pittsburgh . . .	18.45	18.45	18.10	13.45
Wire rods, Pittsburgh . . .	19.75	19.25	19.25	15.75

Billets, etc., Per Gross Ton:

Bess. billets, Pittsburgh . .	32.00	32.00	32.00	19.50
O.-h. billets, Pittsburgh . .	33.00	33.00	33.00	19.50
O.-h. sheet bars, P'gh . .	35.00	35.00	35.00	20.50
Forging billets, base, P'gh .	55.00	55.00	52.00	24.00
O.-h. billets, Phila. . .	42.00	42.00	40.00	21.40
Wire rods, Pittsburgh . . .	45.00	42.00	40.00	25.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia . .	2.259	2.259	2.059	1.17 1/2
Iron bars, Pittsburgh . .	1.95	1.95	1.80	1.15
Iron bars, Chicago . . .	1.75	1.75	1.75	0.97 1/2
Steel bars, Pittsburgh . .	2.00	2.00	2.00	1.10
Steel bars, New York . .	2.169	2.169	2.169	1.26
Tank plates, Pittsburgh . .	2.25	2.25	2.25	1.10
Tank plates, New York . .	2.519	2.419	2.419	1.26
Beams, etc., Pittsburgh . .	1.90	1.90	1.90	1.10
Beams, etc., New York . .	2.069	2.069	2.069	1.26
Skelp, grooved steel, P'gh .	1.80	1.80	1.70	1.10
Skelp, sheared steel, P'gh .	1.90	1.90	1.80	1.15
Steel hoops, Pittsburgh . .	2.00	2.00	2.00	1.20

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Pig Iron.—The local market is almost devoid of new inquiry. The molders' strike has shut off the consumption of foundry iron to a large extent, and founders are not now in the humor for buying for last half delivery. Inquiries for Bessemer iron for shipment to Italy are being sent here from New York, and on these \$22 or higher is being quoted. A sale of 1000 tons of basic iron at \$17.85 and another of 1500 tons, at \$18, Valley furnace, are reported. We quote standard Bessemer iron at \$20.50 to \$21; basic, \$17.75 to \$18; malleable Bessemer, \$17.50; gray forge, \$17.50, and No. 2 foundry, \$18.50 to \$19, all at Valley furnace, the freight rate for delivery in the Cleveland and Pittsburgh districts being 95c. per ton.

Billets and Sheet Bars.—The steel market is quiet as to new inquiry, but prices are very strong, and the mills are still far behind in deliveries of sheet bars and billets. Inquiry for forging billets has quieted down; in fact, little has been done in this market for some time. We quote Bessemer billets and sheet bars at \$32 to \$33 and open-hearth billets and sheet bars at \$33 to \$35, maker's mill, Pittsburgh or Youngstown district. We quote forging billets at \$55 to \$56, for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 per ton extra.

Ferroalloys.—Consumers of ferromanganese in this section are getting uneasy about their future supply, it being predicted that prices on both English and domestic will soon be much higher than they are now. An Ohio interest, that is said to have recently been caught short of a prompt supply, is credited with having bought about 200 tons or more of English 80 per cent ferromanganese, for which it paid \$150 per ton, Baltimore. The absolute minimum price on English 80 per cent ferromanganese is \$125, seaboard, with the same restrictions on the buyers that have been in force for some months. Domestic 80 per cent is quoted at \$120 to \$135, maker's furnace. Effective Feb. 1, the freight rate on ferromanganese from Baltimore to Pittsburgh and Wheeling will be \$2.46 per gross ton, and to New Castle and Youngstown, \$2.92 per gross ton. We quote 50 per cent ferrosilicon for delivery through all of 1916 as follows: Up to 100 tons, \$85; over 100 tons and up to 600 tons, \$84, and over 600 tons, \$83; all per gross ton, delivered in the Pittsburgh district.

	Jan. 19,	Jan. 12,	Dec. 22,	Jan. 20,
Sheets, Nails and Wire,	1916.	1916.	1915.	1915.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh . .	2.60	2.60	2.50	1.80
Galv. sheets, No. 28, P'gh . .	4.75	4.75	4.75	2.75
Wire nails, Pittsburgh . . .	2.10	2.10	2.10	1.55
Cut nails, Pittsburgh . . .	2.00	2.00	1.90	1.50
Fence wire, base, P'gh . .	1.95	1.95	1.95	1.35
Barb wire, galv., P'gh . .	2.95	2.95	2.95	1.95

Old Material, Per Gross Ton:

	Jan. 19,	Jan. 12,	Dec. 22,	Jan. 20,
Iron rails, Chicago . . .	17.50	17.50	16.00	11.50
Iron rails, Philadelphia . .	19.50	19.50	19.50	13.00
Carwheels, Chicago . . .	14.75	14.75	14.50	10.00
Carwheels, Philadelphia . .	16.50	16.50	16.00	11.00
Heavy steel scrap, P'gh . .	17.50	17.50	17.50	11.75
Heavy steel scrap, Phila. .	16.50	16.50	16.00	10.00
Heavy steel scrap, Ch'go . .	15.25	15.50	15.75	9.50
No. 1 cast, Pittsburgh . . .	15.75	15.25	15.25	11.25
No. 1 cast, Philadelphia . .	17.00	17.00	16.75	12.00
No. 1 cast, Ch'go (net ton)	13.00	13.50	13.75	9.25

Coke, Connellsville, Per Net Ton at Oven:

	Furnace coke, prompt . .	\$3.00	\$2.50	\$3.25	\$1.50
Furnace coke, future . . .	2.50	2.50	2.40	1.65	
Foundry coke, prompt . . .	3.50	3.50	3.25	2.00	
Foundry coke, future . . .	3.25	3.25	3.00	2.15	

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York . .	24.00	24.00	20.25	14.00
Electrolytic copper, N. Y. .	23.62 1/2	23.87 1/2	20.25	13.87 1/2
Spelter, St. Louis . . .	18.25	17.25	17.25	6.10
Spelter, New York . . .	18.50	17.50	17.50	6.25
Lead, St. Louis . . .	5.70	5.75	5.30	3.50
Lead, New York . . .	5.90	5.90	5.40	3.70
Tin, New York . . .	40.75	41.50	39.50	33.85
Antimony, Asiatic, N. Y. .	42.00	41.00	39.00	none
Tin plate, 100-lb. box, P'gh .	33.75	33.75	33.50	\$3.10

Plates.—Local mills are filled for four or five months, and plates for reasonably prompt shipment still bring heavy premiums. The Chesapeake & Ohio Railroad has placed 1000 steel hopper cars and the Lake Terminal Railway 50 hopper bodies, both with the Pressed Steel Car Company. The Lehigh Valley has divided 1500 steel-end and steel underframe automobile cars equally among the Standard Steel Car Company, American Car & Foundry Company and Pullman Company. The Pennsylvania Railroad, Jan. 15, placed a contract with the Cambria Steel Company for 3000 and with the Ralston Steel Car Company for 2000 gondola cars. The Cambria Company will furnish the plates and shapes, about 30,000 tons, for the Ralston cars. We quote 1/4-in. and heavier plates nominally at 1.85c. for shipment at convenience of the mill, while for delivery in three or four weeks from 2.25c. to 2.50c. is quoted. It is said that several carloads of plates for prompt delivery have sold at close to 3c. at mill.

Structural Material.—Inquiry is heavy, but local fabricators are not bidding on much new work, as they are filled for five or six months and cannot make deliveries. The American Bridge Company has taken 1500 tons of bridge work for the Erie Railroad and has closed several other contracts involving 8000 to 10,000 tons, details about which are not ready to be given out. An unconfirmed report is that an inquiry is in the market from the Dutch East Indies for eleven railroad bridges, taking 42,000 tons. Senator George T. Oliver has contracted with the Thompson-Starrett Company for the new Chamber of Commerce Building that he will erect in Pittsburgh and for which the American Bridge Company will fabricate and erect about 12,000 tons of steel. We quote beams and channels up to 15 in. at 1.85c. for delivery at convenience of the mill, and 2c. to 2.25c. for shipment from warehouse.

Steel Rails.—The demand for light rails from the coal mining interests is quite active, but from the suburban lines is only fair, as not much new construction work of the latter character is being done at present. Some fair sized orders for standard sections are being placed. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth steel, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows: 25 to 45 lb. sections, 1.55c.; 16 and 20 lb., 1.60c.; 12 and 14 lb., 1.65c.; 8 and 10 lb., 1.70c., in carloads, the usual advances being charged for less than carloads.

Sheets.—The demand for blue annealed and electrical sheets continues enormously heavy. Light black and galvanized sheets are fairly active. It is evident, however, that some of the mills can take on more business in light black sheets for reasonably prompt shipment, and the price of 2.60c. is sometimes shaded, several mills having recently named as low as 2.50c., Pittsburgh. Most of the leading sheet mills are operating to practically 100 per cent of capacity and are pretty well sold for the first quarter, while they have entered some orders for second quarter. For delivery through first quarter we quote Nos. 9 and 10 blue annealed sheets at 2.40c. to 2.50c.; No. 28 Bessemer black, 2.60c.; No. 28 galvanized, 4.75c. to 5c. We quote Nos. 22 and 24 black plate, tin mill sizes, H. R. and A., at 2.30c. to 2.40c.; Nos. 25, 26 and 27, 2.35c.; No. 28, 2.40c.; No. 29, 2.45c., and No. 30, 2.50c. These prices are for carload and larger lots, f.o.b. maker's mill.

Tin Plate.—Mills report that specifications now on their books will largely take their output for the next three months. Specifications will shortly start to come in from the leading can makers and other large consumers for their plate to be made into finished products in the late spring and summer months. The American Sheet & Tin Plate Company has booked an order for 100,000 boxes for the manufacture of containers for export. The export demand is active, and in nearly all export sales higher than domestic prices are obtained. On one fairly large lot booked recently for shipment to India, close to \$4 per base box is said to have been obtained. The tin-plate mills are running full, but occasionally are short of steel, owing to delayed shipments by the mills. We quote 14 x 20 coke plates at \$3.75 to \$3.90 per base box, and 200-lb. base, common ternes, 8-lb. coating, at \$6.90 to \$7 per box.

Railroad Spikes.—The market is reported firm at the recent advance and jobbers are buying freely, but specifications from the railroads are slow. We quote:

Standard railroad spikes, 4 1/2 x 9/16 in. and larger, \$2.25; railroad spikes, 1/4 and 7/16 in., \$2.35 base; railroad spikes, 5/16 in., \$2.50 base, boat spikes, \$2.35 base, all per 100 lb., f.o.b. Pittsburgh.

Skelp.—The new demand is more active and skelp mills report they have their output sold for three or four months. Prices are very strong as follows: Grooved steel skelp, 1.80c. to 1.85c.; sheared steel skelp, 1.90c. to 1.95c.; grooved iron skelp, 2.20c. to 2.25c., and sheared iron skelp, 2.30c. to 2.35c., all delivered to consumers' mills in the Pittsburgh district.

Wire Rods.—Very high prices are reported as having been paid for rods for export, \$60 having been named. Local mills are unable to take on any new business for delivery over the coming six months, requiring their entire output for their own needs and to take care of regular customers as best they can. It is stated that some consumers have recently placed contracts for second quarter delivery and have paid as high as \$46 to \$48 at mill. We quote: Bessemer, open-hearth and chain rods, \$45 to \$46, f.o.b. Pittsburgh. It is said that for reasonably prompt domestic shipment as high as \$50 has been offered.

Wire Products.—The wire trade continues most active, makers having their output sold up for first half and practically not quoting on new business. Three of the leading local wire makers and the Youngstown interest have been practically out of the market for several months, having all the obligations for wire and wire nails on their books they can take care of up to July. Heavy premiums are still being offered for early deliveries of barb wire, without avail. Prices quoted to the large trade and for shipment at convenience of the mill, are as follows: Wire nails, \$2.10; galvanized nails 1 in. and longer taking an advance over this price of \$2, and shorter than 1 in., \$2.50; plain annealed wire, \$1.95; galvanized barb wire and fence staples, \$2.95; painted barb wire, \$2.25; polished fence staples, \$2.25, all f.o.b. Pittsburgh, with freight added to point of delivery; terms sixty days net, less 2 per cent off for cash in ten days. Prices on woven wire fencing are 67 1/2 per cent off list for carload lots, 66 1/2 per cent for 1000-rod lots, and 65 1/2 per cent for small lots, f.o.b. Pittsburgh.

Hoops and Bands.—It is confirmed that the Carnegie Steel Company will erect 10 hoop and steel-bar mills near Girard, Ohio. Specifications against contracts for hoops and bands are heavy and the mills are back in deliveries 10 to 12 weeks or longer. The new demand is also active. The nominal prices of steel hoops is 2c. and steel bands 1.85c., with extras on the latter as per the steel bar card. These prices are for such deliveries as the mills can make, which would be three to four months or longer from date of order.

Shafting.—The present discounts of 45 per cent off in carloads and 40 per cent in less than carloads, f.o.b., Pittsburgh, on cold-rolled shafting are purely nominal. Makers have their output sold up for five to six months and are not quoting on new inquiries, except to regular customers. It is said that premiums are still being paid on shafting for prompt shipment.

Iron and Steel Bars.—The mills are congested with orders for steel bars and are back in deliveries 10 to 12 weeks or longer. Several heavy inquiries for steel rounds for export are in this market, but local mills are unable to make deliveries wanted. It is said that 3.50c. to 4c. has been offered recently for steel rounds without getting them. The mills to be built by the Carnegie Steel Company near Girard, Ohio, will not be factors in the steel-bar situation for at least a year. The new demand for iron bars is active and the mills are pretty well sold up for the next three or four months. We quote steel bars at 1.85c., for delivery at convenience of the mill, 2c. to 2.25c. for shipment in three to four weeks, and 2.35c. to 2.50c. for delivery from warehouse. We quote refined iron bars at 1.90c. to 2c., and railroad test bars, 2.05c. to 2.10c., f.o.b. maker's mill.

Nuts and Bolts.—Makers report great difficulty in getting deliveries of steel from the mills, thus restricting the output of nuts and bolts to a considerable extent. The demand is heavy and export inquiry is active. Discounts in effect at this writing for shipment at convenience of the maker are as follows:

Carriage bolts, small, rolled thread, 70 & 12 1/4 per cent off; small, cut thread, 70 & 5; large, 65. Machine bolts with h. p. nuts, small, rolled thread, 70 & 10 & 7 1/2; small, cut thread, 70 & 12 1/4; large, 65 & 10. Machine bolts with c. p. c. & t. nuts, small, 70; large, 60 & 10. Bolt ends, with h. p. nuts, 65 & 10; with c. p. nuts, 60 & 10. Lag screws (cone or gimlet point), 75. Rough stud bolts, 60. Forged set screws and tap bolts, 40. Hot pressed square nuts, tapped or blank, \$4.50 off list; hexagon, \$4.70 off. C. p. c. & t. square nuts, tapped or blank, \$4.00 off; hexagon, \$5.25 off. C. p. plain square nuts, tapped or blank, \$4.00 off; hexagon, \$4.20 off. Semi-finished hexagon nuts, 80 per cent off. Finished and case-hardened nuts, 75 & 10. Rivets, 7/16 in. diameter and smaller, 70 & 10. These prices are delivered in lots of 300 lb. or more where the actual freight rate does not exceed 20c. per 100 lb.

Merchant steel.—Specifications against contracts are very active and the mills are sold up for three or four months. Prices are very strong and likely to be higher. On small lots we quote: Iron finished tire, 1/4 x 1 1/2 in. and larger, 2.05c., base; under 1/4 x 1 1/2 in., 2.20c.; planished tire, 2.25c.; channel tire, 3/4 to 7/8 in. and 1 in., 2.55c. to 2.65c.; 1 x 1 1/2 in. and larger, 2.95c.; toe calk, 2.65c. to 2.75c., base; flat sleigh shoe, 2.40c.; concave and convex, 2.45c.; cutter shoe, tapered or bent, 2.95c. to 3.05c.; spring steel, 2.65c. to 2.75c.; machinery steel, smooth finish, 2.45c.

Rivets.—Makers report the demand very heavy, and with the embargo on export shipments declared off, delays in deliveries to domestic consumers will likely be longer. Prices are strong. We quote button-head structural rivets, 1/2 in. and larger, at \$2.60, and cone-head boiler rivets at \$2.70 per 100 lb., in carload lots, f.o.b., Pittsburgh, smaller lots bringing about 10c. advance.

Carwheels.—The Carnegie Steel Company will furnish 16,000 forged steel carwheels for 2000 steel hopper cars to be built for its Bessemer & Lake Erie Railroad by the Standard Steel Car Company. The two local makers of steel wheels have their entire output sold for six months or longer. We quote 33-in. freight carwheels in lots of 1000 or more at \$18; 33-in. tender wheels, \$21; 36-in. passenger or tender wheels, \$25. These prices are based on a 10-in. diameter hub, 50c. extra being charged for 11-in., all f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—Makers state they are sold

up for four or five months on all the material they can turn out, and are quoting only in a few cases on inquiries from regular customers. The base price of cold-rolled strip steel, 1½ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., is \$4. Standard extras, named by all the makers, are as follows:

0.10 to 0.19 Carbon—1½ In. and Wider		Lengths 24 In. and Over	
Coils	Lengths	Hard	Soft
Hard	Soft	\$0.10	\$0.35
Base	100 and heavier	0.20	0.45
\$0.05	0.050 to 0.099	0.35	0.60
0.20	0.035 to 0.049	0.60	1.00
0.35	0.031 to 0.034	0.85	1.25
0.45	0.025 to 0.030	1.05	1.45
0.55	0.020 to 0.024	2.45	2.45
1.35	0.017 to 0.019	2.85	2.85
1.75	0.015 to 0.016	3.70	3.70
2.45	0.013 to 0.014	4.30	4.30
2.80	0.012	4.65	4.65
3.15	0.011	5.00	5.00
3.50	0.010		

Extras for soft apply for all intermediate tempers.

Wrought Pipe.—Mills report that the recent advances in prices on black and galvanized iron and steel pipe are holding firm. The demand for merchant pipe is quite active and for oil country goods is fair. The pipe mills are now operating from 75 to 85 per cent of capacity and have a large amount of work ahead. Discounts are printed on another page.

Boiler Tubes.—The demand for locomotive and merchant tubes is heavy, while on seamless tubing the two local makers state they are filled up to July 1 or longer. Prices are very firm. Discounts are given on another page.

Old Material.—The leading consumer is credited with having bought recently 10,000 to 12,000 tons of heavy steel scrap from local dealers and is also said to have secured the steel scrap in this month's Pennsylvania Railroad list. The demand for low phosphorus melting stock and also for machine shop turnings is quiet, and prices are easier. It is said that heavy sales of steel scrap have been made as high as \$18, delivered to consumers' mills, but the market to-day is probably a little under that figure. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight, as follows, per gross ton:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$17.50 to \$18.00
Compressed side and end sheet scrap	16.25 to 16.50
No. 1 foundry cast	15.75 to 16.00
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	14.50 to 15.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	18.00 to 18.25
No. 1 railroad malleable stock	15.50
Railroad grate bars	10.75 to 11.00
Low phosphorus melting stock	20.50 to 21.00
Iron car axles	24.50 to 25.00
Steel car axles	26.00 to 26.50
Locomotive axles, steel	24.00 to 24.50
No. 1 busheling scrap	15.00
Machine shop turnings	9.75 to 10.00
Old carwheels	14.50
Cast-iron borings	10.75 to 11.00
Sheet bar crop ends	18.00 to 18.50
Old iron rails	16.00 to 16.50
No. 1 railroad wrought scrap	18.50 to 19.00
Heavy steel axle turnings	13.50 to 14.00
Heavy breakable cast scrap	13.50 to 14.00

*Shipping point.

Coke.—The embargo on coke routed to the Republic and Youngstown Sheet and Tube companies has been lifted, and as a result the accumulations of prompt furnace coke have been taken up and the price is higher. We note sales of probably 50 cars of prompt standard blast-furnace coke at \$3 per net ton at oven. There is no inquiry for contract coke, consumers being covered for first half. New inquiry for foundry coke is fairly active. We quote best grades of blast-furnace coke for spot shipment at \$3, and on contracts for first half \$2.50 to \$2.75 is quoted. We quote best grades of 72-hr. foundry coke for prompt shipment at \$3.50 to \$3.75, and on contracts from \$3.25 to \$3.50 per net ton at oven. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Jan. 8 as 429,968 net tons, an increase over the previous week of over 50,000 tons.

A monthly bulletin, *The Technician*, "devoted to the professional interests of technical men," is published by Associated Technical Men, Inc., 1215 Monadnock Building, Chicago.

Chicago

CHICAGO, ILL., Jan. 19, 1916.—(By Wire.)

The market in finished steel products is experiencing a lull, the reason for which is clearly not so much a lack of desire by consumers for additional material as to the near deadlock with respect to securing what is needed. There is no opportunity for further contracting in the first half and there is little encouragement to second half contracting except where specific business already secured is to be covered. The effects of material shortage are unmistakably apparent. In many lines where plates, bars, sheets and wire rods are the essential raw materials, manufacturing operations are measurably curtailed. A large implement interest, whose canvass of the situation indicated a market for 24,000 machines, has material for but 18,000 and will limit its operations to the smaller output. The high prices obtaining for reasonably prompt deliveries appear to be a preventive of anything but buying for the most urgent needs. An interesting circumstance is the lower level of prices for material out of stock as compared with mill quotations for prompt delivery, which is explained by the fact that the stores are limiting themselves to the smaller tonnages required by their normal trade. Rail buying continues of importance, there being at present some 50,000 tons under inquiry in addition to several sales in small amounts. There is also in this market inquiry for cars to the number of over 20,000. Inquiry for iron and steel in various forms for export is decidedly miscellaneous and the tonnages covered range from small to large. The development of the pig-iron situation for the first half is in a very satisfactory direction, the foundry melt giving promise of using up all of the iron that has been bought. Prices of scrap are generally lower.

Pig Iron.—Although inquiry has subsided somewhat since the beginning of this month, there appeared last week several tonnages of size. Interest in second half contracts has markedly declined but users of pig iron are increasingly evidencing their need of all of the iron they have bought. The melt has in fact increased beyond expectations in a number of lines and early purchases are found to be insufficient. Local iron remains at the levels last quoted and Southern iron continues to be sold here on the basis of \$15.50, Birmingham, for No. 2 to be shipped in the first half and \$16 for second half. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	\$19.75
Lake Superior charcoal, No. 1	20.75
Lake Superior charcoal, No. 6 and Scotch	21.25
Northern coke foundry, No. 1	19.00
Northern coke foundry, No. 2	18.50
Northern coke foundry, No. 3	18.00
Southern coke, No. 1 f'dry and 1 soft	\$19.50 to 20.00
Southern coke, No. 2 f'dry and 2 soft	19.00 to 19.50
Malleable Bessemer	19.00
Basic	18.00
Low phosphorus	32.00 to 36.00
Silvery, 8 per cent	26.50
Silvery, 10 per cent	27.50

(By Mail)

Rails and Track Supplies.—The buying of rails continues to bring small tonnages to the mills in an aggregate that is surprisingly large. Inquiries total 50,000 tons, for which orders are likely to be placed within a few days. The demand for light rails has steadily improved, both for lumbering and mining purposes, and prices are showing an upward tendency. We quote standard railroad spikes at 2.10c., base; track bolts with square nuts, 2.50c., base, all in carload lots. Chicago; tie plates, \$36, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, 1.25c., base, open hearth, 1.34c.; light rails, 25 to 45 lb., 1.43c.; 16 to 20 lb., 1.48c.; 12 lb., 1.53c.; 8 lb., 1.58c.; angle bars, 1.50c., Chicago.

Structural Material.—Car inquiry is again running to large figures, the total being materially augmented by the 10,000 cars which the Russian Government proposes to buy. Other inquiry includes about 4000 cars for the New York Central Lines, from 4000 to 5000

cars for the Southern Pacific and 2000 for the Union Pacific. The Lehigh Valley has bought 1500 cars, of which 500 will be built by the Pullman Company. In connection with the Russian inquiry a Western car builder has made reservation for the necessary steel which will probably approximate 75,000 tons. An interesting feature of the structural situation is the larger number of small jobs for which contracts are being taken by the fabricating shops. Exclusive of about 950 tons for plant additions at the South works of the Illinois Steel Company, which the American Bridge Company will furnish, there were reported last week some ten contracts, the largest of which did not exceed 400 tons. The Northern Pacific Railroad placed some bridge work for 1916, amounting to 680 tons. The placing of new tonnage with the mills is not active, although there has been some booking of structural material for rolling in the third and fourth quarters at 1.85c. and 1.90c., Pittsburgh. We quote for Chicago delivery of structural material from mill 2.039c. to 2.089c.

Buying out of stock is experiencing a lull, although considerable inquiry for large tonnages is being met with refusals to quote. We continue to quote for Chicago delivery from store, 2.50c.

Plates.—With each week the difficulty of securing plates becomes more pronounced and, for the limited tonnage available for prompt shipment, larger premiums are being asked. Prices between 2.50c. and 3c., Pittsburgh, seem to be the rule. For future delivery of plates from mill we quote 2.039c. to 2.689c., Chicago.

We quote for Chicago delivery of plates out of stock, 2.50c.

Sheets.—The special demand for blue annealed sheets is again emphasized in the further advance of prices to the basis of 2.60c., Pittsburgh. This is practically up to the level of black sheets, which ordinarily command at least \$4 per ton above blue annealed. We quote for Chicago delivery from mill, No. 10 blue annealed, 2.789c.; No. 28 black, 2.839c. to 2.889c.; No. 28 galvanized, 4.689c. to 5c.

The price of black sheets out of Chicago store has been advanced \$2 per ton, representing, it is understood, a condition pertaining to local stocks rather than any special demand. We quote for Chicago delivery from jobbers' stock as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 2.70c.; No. 28 black, 3c.; No. 20 and heavier galvanized, 4.80c.; No. 22 and lighter, 5a.

Bars.—The demand for bars is not important with respect to tonnage. The bar-iron mills are comfortable, with their operations secured for sixty days. Prompt-delivery inquiry for steel bars is limited and prices ranging from 2.25c., Pittsburgh, to 2.50c. are being asked by the mills. We quote mill shipments, Chicago, as follows: Bar iron, 1.75c. to 1.80c.; soft steel bars, 2.039c. to 2.439c.; hard steel bars, 1.80c. to 2c.; shafting, in carloads, 45 per cent off; less than carloads, 40 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 2.40c.; bar iron, 2.40c.; reinforcing bars, 2.40c., base, with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over and usual card extras for smaller sizes; shafting 30 per cent off.

Rivets and Bolts.—A further advance in the price of bolts and nuts, effective Jan. 12, has been announced. The difficulties being experienced by bolt manufacturers in securing raw material are already so curtailing operations as to make additional business a burden and the higher prices apparently are sought as a check upon buying. The demand for rivets is not exceptional, but the makers have sufficient business to operate practically at capacity. We have revised our prices and quote as follows: Carriage bolts up to $\frac{3}{8}$ x 6 in., rolled thread, 70; cut thread, 65-10; larger sizes, 60-5; machine bolts up to $\frac{3}{8}$ x 4 in., rolled thread, with hot pressed square nuts, 70-5; cut thread, 70; larger sizes, 60-10; gimlet point coach screws, 70-10; hot pressed nuts, square, \$4 off per 100 lb.; hexagon, \$4.20 off. Structural rivets, $\frac{3}{8}$ to $1\frac{1}{4}$ in., 2.60c. to 2.65c., base, Chicago, in carload lots, boiler rivets, 10c. additional.

We quote revised prices, out of store: Structural rivets, 2.75c.; boiler rivets, 2.85c.; machine bolts up to $\frac{3}{8}$ x 4 in., 70-12 $\frac{1}{2}$; larger sizes, 65-10; carriage bolts up to $\frac{3}{8}$ x 6 in., 70-5; larger sizes, 65 off; hot pressed nuts, square, \$4.50, and hexagon, \$4.70 off per 100 lb.; lag screws, 75.

Cast-Iron Pipe.—Included in the prospective pipe

business of the near future are lettings of 800 tons at Saginaw and 600 tons at Grand Rapids, Mich., 1500 to 2500 tons at St. Paul and 300 tons at Fort Wayne. At Elyria, Ohio, the Massillon Iron & Steel Company is low bidder on 500 tons. The Union Pacific Railroad has bought 1000 tons of 24 and 48 in. pipe from the leading interest. Among recent specifications was 600 tons of gas pipe for Grand Rapids. Prices have been advanced \$1 per ton for large pipe and \$2 for 4-in. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$32.50 to \$33; 6 in. and larger, \$29.50 to \$30, with \$1 extra for class A water pipe and gas pipe.

Wire Products.—The tendency continues so strongly in the direction of a diminishing supply of wire in various forms as compared with the demand that the high level in prices seems not yet to have been reached. With respect to wire rods in particular, the demands of the manufacturing trade are considerably short of being satisfied. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, \$2.139; wire nails, \$2.289; painted barb wire, \$2.439; galvanized barb wire, \$3.139; polished staples, \$2.439; galvanized staples, \$3.139, all Chicago.

Old Material.—In nearly every direction the market shows signs of weakness, prices being from 25c. to 50c. per ton lower. At the works of most of the large consumers there is a congestion of incoming material, although the embargo at Indiana Harbor was raised last week. The softness is being felt particularly in connection with steel scrap, which is being offered freely and thus far is still moving to delivery points more rapidly than it is being melted. Railroad offerings of the week include 5500 tons from the Santa Fe, 2500 tons from the Chicago Great Western, 1200 tons from the Vandalia, 400 tons from the Illinois Central and 500 carwheels from the Street's Company. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton
Old iron rails	\$17.50 to \$18.00
Relaying rails	19.50 to 20.50
Old carwheels	14.75
Old steel rails, rerolling	17.00 to 17.50
Old steel rails, less than 3 ft.	16.50 to 16.75
Heavy melting steel scrap	15.25 to 15.75
Frogs, switches and guards, cut apart	15.25 to 15.75
Shoveling steel	14.75 to 15.25
Steel axle turnings	11.75 to 12.25

	Per Net Ton
Iron angles and splice bars	\$17.00 to \$17.25
Iron arch bars and transoms	18.00 to 18.50
Steel angle bars	14.00 to 14.50
Iron car axles	19.50 to 20.00
Steel car axles	21.50 to 22.00
No. 1 railroad wrought	15.75 to 16.00
No. 2 railroad wrought	14.00 to 14.50
Cut forge	14.00 to 14.50
No. 1 busheling	13.00 to 13.25
No. 2 busheling	9.25 to 9.50
Pipes and flues	11.50 to 12.00
Steel knuckles and couplers	14.75 to 15.25
Steel springs	15.75 to 16.25
No. 1 boilers, cut to sheets and rings	11.00 to 11.50
Boiler punchings	13.75 to 14.25
Locomotive tires, smooth	17.00 to 17.50
Machine shop turnings	8.50 to 8.75
Cast borings	7.75 to 8.00
No. 1 cast scrap	13.00 to 13.50
Stove plate and light cast scrap	11.00 to 11.25
Grate bars	11.00 to 11.25
Brake shoes	10.25 to 10.75
Railroad malleable	13.75 to 14.00
Agricultural malleable	11.50 to 12.00

Philadelphia

PHILADELPHIA, PA., Jan. 18, 1916.

As the steel market becomes monotonous in dull times because of the lack of business, so it is now because of the overloaded condition of the mills and their lack of interest in new business. Many salesmen are chafing at the restraint under which they are placed. The plate situation is tighter than ever and a growing number of consumers are in distress, especially boiler and tank makers. One eastern Pennsylvania maker cannot promise deliveries on new business this side of July. It is difficult to obtain a quotation on steel bars, and iron bars have been advanced. Inquiry is more frequent and more insistent for structural material, and the recent lull is probably at an end. Pig iron is becoming more active, although it is now seen that in the holiday lull more than the usual amount of business was done for such times. The Virginia producers con-

time to find the greatest difficulty in supplying their New England customers. Quotations for all grades are unchanged. Coke is a trifle easier. The week was quieter than had been expected in the old material market. New business in foreign ore continues dormant. The Pennsylvania Steel Company has approved designs for two new ore vessels which will be built by the Maryland Steel Company, Sparrows Point, Md., and used to insure the company's supply of Mayari ore from its mines in Cuba.

Pig Iron.—The lull in buying which came with the new year proved to be short-lived, and the indications are that activity will soon be in full swing again, if it is not already. At least one interest was agreeably surprised when its business of the first half of January was summed up. Between January 12 and 15 consumers were especially active, and the orders almost uniformly called for fair-sized tonnages. Other producers report a more active inquiry for foundry grades, but few or none of the inquiries specify 1000 tons or over. It is believed that a considerable quantity of iron will yet be bought for first half delivery, a view supported by the fact that some consumers who were believed to be covered have again come into the market. A cast-iron pipe maker took 1200 tons of gray forge last week. The minimum quotation for eastern Pennsylvania No. 2 X appears to be around \$20, delivered, but in various deals this price has been shaded a little. The quotations for basic and Virginia iron are unchanged. Virginia furnaces continue to experience great trouble in getting shipments into New England because of the freight congestion, and office managers are confining their endeavors to getting shipments through, rather than selling. They say that conditions have not improved despite statements that some of the embargoes have been raised, and as matters stand they are making iron faster than it is being delivered. Attempts to ship by water have afforded no relief. In steel-making iron business has been light. A central Pennsylvania steel company took 6000 tons of Valley basic in the week, the price not being reported here. A broker has been inquiring for 1000 tons of basic. Incidentally, frequent inquiries are received from brokers and export agents for Bessemer iron. Low phosphorus is unchanged at \$32, delivered, with business limited by the sold-up condition of the producers. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa., No. 2 X foundry	\$20.00 to \$20.50
Eastern Pa., No. 2 plain	19.75 to 20.25
Virginia, No. 2 X foundry	20.00 to 20.50
Virginia, No. 2 plain	19.50 to 20.00
Gray forge	18.25 to 19.75
Basic	19.50 to 20.00
Standard low phosphorus	32.00

Iron Ore.—Arrivals of foreign ore at this port in the week ended Jan. 15 consisted of 5050 tons from Spain and 7000 tons from Sweden. The Pennsylvania Steel Company has approved plans for two steamships of 12,000 tons each, to be built by the Maryland Steel Company, and to be used in bringing ore from the deposits which the company owns in Cuba. It has built up a good trade in Mayari steel, so-called from the Cuban ore used, containing chrome and nickel, and for this reason, as well as for financial considerations, is planning to insure its future supply. The new boats can carry 600,000 tons per annum. It is understood that the building of the boats will be hurried.

Ferroalloys.—The quotation for forward deliveries of English 80 per cent ferromanganese is unchanged at \$125, seaboard. The arrival of 592 tons at this port is reported. Indian manganese ore is quoted at 75c. per unit, Baltimore. The high price is due to the freight rate, which is now 120s per ton. The normal rate is about 21s.

Plates.—All eastern Pennsylvania makers quote 2.50c., Pittsburgh, or 2.659c., Philadelphia, as the minimum. A leading maker cannot promise any deliveries on new business this side of July, and his top quotation is 2.75c., Pittsburgh. Boiler and tank shops are in greater distress than ever because of the shortage of material, and several are said to contemplate shutting down, as two or three already have done.

Bars.—The quotation of 1.85c., Pittsburgh, equal to

2.009c., Philadelphia, is declared to be entirely nominal. Several makers continue out of the market. Iron bars are quoted at 2.259c., Philadelphia, although one eastern Pennsylvania mill asks 2.409c., for carloads. The demand continues strong.

Structural Material.—Inquiry is more active and insistent, and the recent lull is passing. Quotations are unchanged, with 2.159c., Philadelphia, the minimum, and prices for deliveries in some sections running up to 2.25c., Pittsburgh or eastern mill, depending on circumstances. The export price is strong at 2c., Pittsburgh. An apartment house in this city, at Thirteenth and Lattimer streets, requiring 325 tons, has been awarded to the Guerber Engineering Company. A large shop building for a company in this vicinity has been practically placed, and may require 4000 tons. The cold weather is hampering mill operations to a small extent.

Billets.—Makers of billets are not only sold up for the first half, but probably oversold. They are endeavoring to distribute their product in a way to take care of all their customers as far as possible, but still they receive many complaints. Forging billets are quoted for future delivery at \$55 to \$60, and open-hearth re-rolling billets at \$42 to \$45.

Sheets.—No. 10 blue annealed sheets are unchanged and strong at 2.75c. to 2.905c., Philadelphia.

Coke.—The furnace coke situation is a little easier, some of the furnaces having got through shipments of quantities ample enough to relieve anxiety. Prompt furnace is quoted at about \$3, and prompt foundry at about \$4 per net ton at oven. First half furnace is quoted at \$2.35 to \$2.50, and contract foundry at \$3 to \$3.50. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

Old Material.—The situation continues strong, although the demand is somewhat irregular. General activity was expected to develop last week, but it has yet to come. Speculation has been entirely eliminated from the market, and buying is confined to the actual needs of the mills. No changes in prices are reported. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel	\$16.50 to \$17.00
Old steel rails, rerolling	19.00 to 20.00
Low phos. heavy melting steel scrap	21.50 to 22.50
Old steel axles	25.00 to 26.00
Old iron axles	27.00 to 28.00
Old iron rails	19.50 to 20.00
Old carwheels	16.50 to 17.00
No. 1 railroad wrought	22.00 to 23.00
Wrought-iron pipe	16.00 to 16.50
No. 1 forge fire	13.50 to 14.00
Bundled sheets	13.50 to 14.00
No. 2 busheling	11.00 to 11.50
Machine shop turnings	11.50 to 12.00
Cast borings	11.50 to 12.00
No. 1 cast	17.00 to 18.00
Grate bars, railroad	12.50 to 13.00
Stove plate	13.00 to 13.50
Railroad malleable	15.00 to 15.50

Cleveland

CLEVELAND, OHIO, Jan. 18, 1916.

Iron Ore.—Considerable ore has been sold in the past ten days, much of this business being the outcome of inquiries that developed before the holidays. Eastern consumers, who showed no interest in Lake Superior ore when the buying movement started, have been buying quite freely recently and, in the opinion of ore men, the aggregate sales of such ore in the East this year considerably exceed those of any previous year. The high ocean rate, with the uncertainty of securing shipments of foreign ore, has been an important factor in stimulating the demand for Lake ore throughout the East. Ore-handling facilities at Buffalo are expected to be taxed to their utmost the coming season because of the increased sales of ore for Eastern shipment, and some concern is being felt as to whether that port will be able to handle all this tonnage. The market has quieted down, and with practically all consumers covered for all or the greater part of their requirements little activity is expected for some time. The anxiety of some shippers to secure vessel capacity is indicated by the closing of a contract by a Cleveland

interest a few days ago for carrying 1,000,000 tons of Lake Superior ore annually for a period of ten years, the rate to be the prevailing contract rate for each year. We quote prices as follows, delivered lower Lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; old range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.55.

Pig Iron.—A fair volume of business is being booked in foundry iron for last half, and some of the leading producers have sold about one-third of their product for that delivery. The market is firm with the exception of the Valley, where some shading from the usual \$19 quotation for No. 2 foundry for last-half delivery has resulted from the weakness of the Buffalo market, where considerable tonnage is understood to have been booked at \$18. In Cleveland the \$19 price is being maintained, and in Toledo \$18.75 is the minimum quotation for No. 2 foundry. A number of inquiries have come from small consumers of Bessemer iron for lots around 500 tons for last-half delivery. Southern iron is quiet with prices unchanged at \$15, Birmingham, for No. 2 for first half and \$15.50 to \$16 for the last half. Several last-half sales of Ohio silvery iron are reported in this market on a basis of \$25 for 8 per cent silicon. Among these is a lot of about 1000 tons of 6 per cent silicon iron taken by a northern Ohio foundry. We quote, delivered Cleveland, as follows:

Bessemer	\$21.45 to \$21.95
Basic	19.30
Northern No. 2 foundry	19.30
Southern No. 2 foundry	19.00 to 19.50
Gray forge	18.30
Jackson Co. silvery 8 per cent silicon	26.62
Standard low phos., Valley furnace	31.00

Finished Iron and Steel.—There is considerable new inquiry both for steel for specific work and from manufacturers for future requirements. With the congested conditions of the mills many manufacturers are becoming anxious about their third-quarter steel, and about the best they can do is to place contracts for delivery at the convenience of the mills at 1.85c. to 1.90c., Pittsburgh, for steel bars, plates and structural material. The embargo on steel shipments to New England has helped the delivery situation somewhat in the Central West. Lake shipbuilders are figuring on several foreign inquiries for boats, deliveries of which cannot be made before next year. A large amount of structural work is in prospect, but the only new inquiry is for 1200 tons for a coal-handling plant for Corrigan, McKinney & Co., Cleveland. The pressure for structural material is not quite as heavy as for plates and steel bars. Local mills quote plates at 2.50c. to 3c., Pittsburgh, for early delivery. Steel bars are quoted at 2.25c., Pittsburgh, for early shipment. The demand for hard steel bars is heavy, and prices have advanced from 1.80c. to 1.85c. and 1.90c., Pittsburgh. Iron bars are quoted at 2c., Pittsburgh, but are offered in this territory at 1.80c., Chicago mill. Shafting is in heavy demand and hard to get for early shipment. The demand for sheets continues active, particularly for blue annealed. We quote sheets at 2.50c. to 2.75c., Ohio mill, for No. 28 black; 2.50c. to 2.60c. for No. 10 blue annealed, and 4.75c. to 5c. for No. 28 galvanized. Local warehouse prices have been advanced on shafting to 30 per cent off, and to 2.75c. for No. 10 blue annealed sheets. Warehouse prices for steel bars, plates and structural material are unchanged at 2.50c.

Bolts, Nuts and Rivets.—Cleveland makers have advanced bolt and nut prices 10 per cent, following similar advances by some makers in other sections. Because of the scarcity of raw material the market is very firm and the new quotations, which are now general, are being maintained. The demand for bolts, nuts and rivets is heavy. Rivets are firm at 2.60c., Pittsburgh, for structural and 2.70c. for boiler rivets for carload lots. Bolt and nut discounts are as follows:

Common carriage bolts $\frac{3}{8}$ x 6 in., smaller or shorter, roll thread, 70 off, cut thread, 65 and 10; larger or longer 60 and 5; machine bolts with h.p. nuts, $\frac{3}{8}$ x 4 in. smaller and shorter, roll thread, 70 and 5; cut thread, 70, larger and longer 60 and 10; lag bolts, gimlet or cone point, 70 and 10, square h.p. nuts, blank or tapped, \$4 off the list; hexagon h.p. nuts blanked or tapped, \$4.20 off; c.p.c. & t. square nuts, blank or tapped \$3.75 off; hexagon nuts, 11 sizes \$4.75 off; cold pressed semi-finished hexagon nuts all sizes 75 and 10 off.

Coke.—The market is dull but prices on foundry

coke are very firm. Best makes of Connellsville foundry coke are selling at \$4 per net ton at oven for prompt shipment. We quote standard Connellsville foundry coke at \$3.50 to \$4 per net ton at oven for prompt shipment and \$3.25 to \$3.75 for contracts extending to July 1, 1917. Furnace coke for prompt shipment is quoted at \$2.50 to \$3. Sales of high-grade coke are being reported at the latter price.

Old Material.—The market is dull and not firm, although price advances have been made on iron and steel axles and two or three other grades. Mills are congested by heavy shipments and the only sales reported are small lots. Steel axles are very scarce and sales are reported at prices higher than the prevailing quotations. A local mill has taken 200 tons of borings at \$9, or at an advance over the recent quotations, and some railroad malleable has been moved at \$17.25. There is no demand for busheling, which has declined 50c. per ton. We quote, f.o.b. Cleveland, as follows:

	Per Gross Ton
Old steel rails	\$15.75 to \$16.00
Old iron rails	19.00
Steel car axles	25.00 to 26.00
Heavy melting steel	16.00 to 16.50
Old carwheels	14.00 to 14.50
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	14.00 to 14.25
Railroad malleable	17.00 to 17.25
Steel axle turnings	13.50 to 14.00
Light bundled sheet scrap	12.75 to 13.25

	Per Net Ton
Iron car axles	\$24.00 to \$25.00
Cast borings	8.50 to 9.00
Iron and steel turnings and drillings	7.25 to 7.75
No. 1 busheling	13.50 to 14.00
No. 1 railroad wrought	17.00 to 17.50
No. 1 cast	13.00 to 13.50
Railroad grate bars	10.50 to 11.00
Stove plate	10.50 to 11.00

Buffalo

BUFFALO, N. Y., Jan. 18, 1916.

Pig Iron.—A good volume of orders is reported, including a number of 1000 tons and upward, for last half delivery. Another sale of hot metal to the Lackawanna Steel Company is also reported, by the Rogers-Brown Iron Company, this for last half delivery. It consists of the output of one of the furnaces at the Susquehanna plant and will aggregate 70,000 to 75,000 tons. There is a growing conviction on the part of producers that there will be a pronounced scarcity of iron within the next few months. For the majority of producers \$18 to \$19, at furnace, is the current price range for No. 2 plain up to No. 1 foundry, for first half delivery, although one furnace interest has established its price range for the lower to the higher grades at \$18.50 to \$19.50, holding malleable at \$19.50. Another large producing interest has established its minimum for any grade for last half delivery at \$19, furnace. Shipments from furnaces are held back to some extent on account of the embargo by eastern railroads on consignments destined for New England points. The Wickwire Steel Company's X furnace went into blast on Jan. 14, after relining. The price schedule of last week, which did not appear in last week's issue of THE IRON AGE on account of the Buffalo report having been unduly delayed in transit, is still in effect this week and we quote same, as follows, f.o.b. furnace, Buffalo, for first half delivery:

No. 1 foundry	\$18.50 to \$19.00
No. 2 X foundry	18.00 to 19.00
No. 2 plain	18.00 to 19.00
No. 3 foundry	17.50 to 19.00
Gray forge	17.50 to 19.00
Malleable	19.00 to 20.00
Basic	20.00
Charcoal, regular brands and analysis	21.00 to 22.00

Finished Iron and Steel.—One producing interest is sold up to such an extent on bars, shapes and plates that it can accept business for fourth quarter delivery only and 1.90c., Pittsburgh, is the price for such business as it accepts. Another mill interest is not accepting any business at present, owing to commitments to full capacity already accepted for first half delivery. Two of the leading producing interests are accepting orders now only for shipment at mills' convenience. They do not expect to open their books for business for last half specifications until next month. Some steel companies who have not covered their regular trade for

second quarter are limiting business to replenishment of stocks. In other instances sales are being made of certain classes of material only. There seems to be more congestion in plates than in almost any other line. It is predicted there will be a scarcity in reinforcing bars when the building season opens. It is understood that users of semi-finished steel and forging billets are having a very hard time in finding sellers. An inquiry for 2000 tons is reported as having been offered the mills during the week without finding a taker. The price range is 1.85c. to 1.90c., Pittsburgh, for bars, plates and shapes, while some of the smaller eastern mills are asking a premium price of 2.25c. to 2.50c. for rollings at their convenience, which is understood to be approximately 60 days. The price of plates from warehouse is 2.75c. to 3c., f.o.b. Buffalo, depending upon the sizes. Bids are in for an office building for J. B. Campbell, Erie, Pa., requiring 300 tons of steel, and bids are to be received this week for Post Office buildings at Hornell, N. Y., and Waterloo, N. Y., and on Jan. 24 for the Merchants National Bank, Middletown, N. Y. The Progressive Steel Company, Buffalo, has 300 tons for a foundry extension for the American Radiator Company, at Buffalo. The King Bridge Company has 1750 tons for the Lehigh Valley Railroad bridge at Geneva, N. Y.

Old Material.—The market has strengthened and indications point to a rise in prices on many commodities, particularly heavy melting steel. The demand for wrought scrap is strong and the price has advanced 50c. per ton. There have been no heavy sales in any line, for the reason that dealers are asking prices which consumers do not desire to pay, and purchasers are consequently restricting transactions principally to carload lots. But many inquiries for heavy tonnages are coming in. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	\$16.50 to \$17.00
Low phosphorous steel	21.00 to 21.50
No. 1 railroad wrought scrap	18.00 to 18.50
No. 1 railroad and machinery cast scrap	15.25 to 15.75
Old steel axles	23.00 to 23.50
Old iron axles	23.00 to 23.50
Old carwheels	15.25 to 15.75
Railroad malleable	15.25 to 15.75
Machine shop turnings	7.75 to 8.25
Heavy axle turnings	12.00 to 12.50
Clean cast borings	9.25 to 9.75
Old iron rails	17.50 to 18.00
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	10.00 to 10.50
Wrought pipe	13.00 to 13.50
Bundled sheet scrap	12.00 to 12.50
No. 1 busheling scrap	14.50 to 15.00
No. 2 busheling scrap	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

Cincinnati

CINCINNATI, OHIO, Jan. 19, 1916.—(By Wire.)

Pig Iron.—The expected buying movement for last half shipment has not developed as fast as was anticipated, but a number of fair sized sales have been made, included in which was one for 1000 tons of Northern and Southern foundry to an Indiana melter. Other smaller orders are reported in the same territory. Approximately 1200 tons of Northern and Southern iron went to a central Ohio melter. Smaller lots were taken by customers in the same territory, but sales to nearby consumers are somewhat limited. General inquiries are scarce, but one from southern Ohio calls for 2000 tons of foundry for last half shipment, and a manufacturer in this territory is asking for 2000 tons of malleable for the same shipment. Southern No. 2 foundry can still be bought at \$14.50, Birmingham basis, although only one furnace interest is openly making this quotation. Some resale iron is also obtainable at the same figure. A Michigan melter has bought 500 tons of Lake Superior charcoal iron for last half delivery. Several other sales of Northern foundry iron were made in the same territory. The Ohio silvery irons are a little more active, and \$25.50 at furnace appears to be the best figure on 8 per cent for prompt shipment, but last half contracts can be made as low as \$25. Northern foundry remains at \$18, Ironton basis, for any shipment this year. A few small sales of Virginia iron were made the past week to nearby consumers. Based on freight rates of

\$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b., Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$17.90 to \$18.40
Southern coke, No. 2 f'dry and 2 soft.	17.40 to 17.90
Southern coke, No. 3 foundry.	16.90 to 17.40
Southern No. 4 foundry.	16.40 to 16.90
Southern gray forge.	15.90 to 16.40
Ohio silvery, 8 per cent silicon.	26.25 to 26.75
Southern Ohio coke, No. 1.	20.76 to 21.26
Southern Ohio coke, No. 2.	19.76 to 20.26
Southern Ohio coke, No. 3.	19.26 to 19.76
Southern Ohio malleable Bessemer.	19.26 to 19.76
Basic, Northern.	19.26 to 19.76
Lake Superior charcoal.	21.20 to 22.20
Standard Southern carwheel.	24.40 to 24.90

(By Mail)

Coke.—Connellsville prices are somewhat unsettled and prompt furnace coke is quoted all the way from \$2.50 to \$3 per net ton at oven. Contract prices range from \$2.30 to \$2.65. No sales are reported in this immediate territory. Connellsville prompt foundry coke ranges from \$3.50 to \$4.50, but contract prices are from \$3 to \$3.60. Wise County and Pocahontas 48-hr. coke is quoted from \$2.75 to \$3.25 and 72-hr. brands \$3.25 to \$3.75. A monthly contract from a Tennessee furnace, averaging 5000 tons, will probably be closed before the week is over. The consumption of foundry coke has increased slightly and shipments are going forward at a satisfactory rate, although car shortage causes some complaint.

Finished Material.—Jobbers' quotations on galvanized sheets continue below those named by the mills and No. 28 sheets can still be bought at 4.75c. to 5c., Cincinnati. Steel bars from stock are quoted at 2.45c. and structural shapes at 2.55c. No. 10 blue annealed sheets are unchanged at 2.70c. The mill price on No. 28 galvanized sheets is 5.15c., Cincinnati or Newport, Ky., and on No. 28 black sheets 2.65c. and 2.70c. Wire products of all kinds are very firm and one sales agency which was authorized to open its books for second quarter business has disposed of its entire available tonnage. Railroad track material is slow.

Old Material.—The market is weaker, although no tangible reason is given for this change. Prices are about 25c. per ton off on all grades, and business is quiet. The minimum prices given below represent what dealers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton	
Bundled sheet scrap	\$10.75 to \$11.25
Old iron rails	15.50 to 16.00
Relaying rails, 50 lb. and up.	21.00 to 21.50
Rerolling steel rails	14.25 to 15.25
Heavy melting steel scrap	14.25 to 14.75
Steel rails for melting	14.00 to 15.00

Per Net Ton	
No. 1 railroad wrought	\$13.50 to \$14.00
Cast borings	7.50 to 8.00
Steel turnings	7.25 to 7.75
Railroad cast scrap	11.75 to 12.00
No. 1 machinery scrap	13.50 to 14.00
Burnt scrap	8.75 to 9.25
Iron axles	19.25 to 19.75
Locomotive tires (smooth inside)	13.25 to 18.75
Pipes and flues	10.25 to 10.75
Malleable and steel scrap	10.75 to 11.25
Railroad tank and sheet scrap	8.75 to 9.25

Birmingham

BIRMINGHAM, ALA., Jan. 17, 1916.

Pig Iron.—Sales have not been as large recently as in the preceding two weeks, but the tonnage disposed of is taken on the prevailing basis of \$15 to \$15.50 for first half and \$16 to \$16.50 for second half. Anything in the way of Southern iron done under the lower figures does not occur in Birmingham district metal at furnaces. Among recent transactions were 1300 tons by one maker at \$15.50 for first half and lots of 900 and 2600 tons for the same delivery at same price by other makers. The leading interest still announces a schedule of \$15 and \$16 for first and second halves respectively, with the Sloss-Sheffield Company 50c above both and the Republic 50c above the first half price. The Woodward Iron Company is on the Republic basis. In all sales now being made the operators are carefully considering productive capacity and stocks to avoid

taking on more than can be handled. Stocks decreased 25,000 tons in December in spite of the record-breaking output. There is evidence that the consumer has covered his wants for the first half pretty fully, so that both consumer and maker are willing to see a buying lull. A continuous increase in foundry activity of all sorts is adding to home consumption and several new plants will soon be taking an additional tonnage. The Chattanooga furnaces have followed the example of the Sloss-Sheffield Company in taking advantage of the cheaper transportation to junction points on the upper Mississippi River offered by barge lines and sent an initial shipment for Ohio territory delivery via Metropolis simultaneously with the moving of the Sloss-Sheffield's first cargo going the same route to the same destination. Furnace output per stack in Alabama has reached another high level. In December the average of the 26 active stacks was 8770 tons for the 31 days, or 283 tons daily. Many of the stacks making this record were originally built for 75 tons output per diem. The Gulf States Steel Company has relit fires in its repaired Gadsden furnace. The January output ought to at least equal that of December, which was 228,000 tons. Nothing further or of a definite nature has been heard of regarding plans to resume at the long idle stacks of the Woodstock Iron Company at Anniston, Ala. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$15.50 to \$16.00
No. 2 foundry and soft	15.00 to 15.50
No. 3 foundry	14.50 to 15.00
No. 4 foundry	14.25 to 14.75
Gray forge	14.00 to 14.50
Basic	15.00 to 15.50
Charcoal	23.00 to 23.50

Cast-Iron Pipe.—A number of orders of appreciable size were received by the active water and gas pipe shops during the week. Several shipments of sanitary pipe have been made recently from Anniston to South America. The Central Foundry Company has resumed at its shops at the furnace plant of the Central Coal & Iron Company at Holt. Conditions generally are unchanged except that quotations are \$1 per ton higher. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., \$25; 6-in. and upward, \$28, with \$1 added for gas pipe.

Coal and Coke.—In some instances higher prices have been secured for coal for the first time in a year. Coke continues to rule high and is in strong demand. There is no surplus of either by-product or beehive. We quote, per net ton, f.o.b. oven, as follows: Beehive furnace, \$2.75 to \$3.25; foundry, \$3.50 for run of ovens and \$3.75 for hand picked, with special brands higher still. By-product rules 25c. to 50c. per ton under these prices.

Old Material.—Dealers find it difficult to keep a respectable quantity of material on yards and are inclined to advance prices again. This will probably be done in the near future. Prices named now are easily realized. We quote, per net ton, f.o.b. dealers' yards, as follows:

Old iron axles	\$14.50 to \$15.00
Old steel axles	14.00 to 14.50
Old iron rails	13.50 to 14.50
No. 1 railroad wrought	10.50 to 11.00
No. 2 railroad wrought	9.00 to 9.50
No. 1 country wrought	9.00 to 9.50
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.00 to 10.50
Tram carwheels	10.00 to 10.50
Stove plate	8.00 to 8.50

St. Louis

ST. LOUIS, Mo., Jan. 17, 1916.

Pig Iron.—The belief is that with the opening of the books regularly for last half deliveries there will be a renewal of buying, the trade having become convinced that there is little likelihood of any better prices, and meanwhile demand is increasing. Specifications on contracts are very liberal and indicate early exhaustion of pro rata amounts. The only inquiry of importance outstanding is one for 1000 tons of malleable.

Coke.—Coke is selling in small lots only, practically all this territory being covered by contracts running to July 1. Local by-product coke is quoted nominally in parity with Connellsville, but competition

usually brings out a price that will take the business.

Finished Iron and Steel.—Architects' boards are filling up with work to be done when the weather opens up. Specifications on contracts are heavy. Tank plate is very scarce and about the hardest item to get delivery on. In standard section steel rails the only business of the week was a sale of 660 tons of 70-lb. material for a Missouri road. The movement out of stock from warehouse is very active at stiffened prices. We quote from warehouse as follows: Soft steel bars, 2.45c.; iron bars, 2.40c.; structural material, 2.55c.; tank plates, 2.55c.; No. 10 blue annealed sheets, 2.75c.; No. 28 black sheets, cold rolled, one pass, 3c.; No. 28 galvanized sheets, black sheet gage, 5.25c.

Old Material.—Mills and foundries have found their yards pretty well filled with the inrush of material already bought and have in one or two instances put on an embargo of a temporary character. This is not expected to last, however, and dealers are holding their prices firmly, believing that good buying will be resumed shortly. Next month is expected to see even higher prices. Sales around \$21 to \$21.50 are reported for relaying rails. We quote dealer's prices, f.o.b., customers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails	\$15.50 to \$16.00
Old steel rails, rerolling	17.00 to 17.50
Old steel rails, less than 3 ft.	16.50 to 17.00
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	13.50 to 14.00
No. 1 railroad heavy melting steel scrap	15.50 to 16.00
Heavy shoveling steel	13.50 to 14.00
Frogs, switches and guards, cut apart	15.50 to 16.00
Bundled sheet scrap	10.00 to 10.50

Per Net Ton	
Iron angle bars	\$15.00 to \$15.50
Steel angle bars	14.00 to 14.50
Iron car axles	20.00 to 20.50
Steel car axles	21.00 to 21.50
Wrought arch bars and transoms	17.00 to 17.50
No. 1 railroad wrought	14.50 to 15.00
No. 2 railroad wrought	14.00 to 14.50
Railroad springs	14.50 to 15.00
Steel couplers and knuckles	15.00 to 15.50
Locomotive tires, 42 in. and over, smooth inside	14.50 to 15.00
No. 1 dealers' forge	12.00 to 12.50
Mixed borings	8.50 to 9.00
No. 1 bushings	12.50 to 13.00
No. 1 boilers, cut to sheets and rings	10.00 to 10.50
No. 1 railroad cast scrap	13.00 to 13.50
Stove plate and light cast scrap	10.00 to 10.50
Railroad malleable	12.00 to 12.50
Agricultural malleable	10.50 to 11.00
Pipes and flues	10.00 to 10.50
Railroad sheet and tank scrap	10.00 to 10.50
Railroad grate bars	9.50 to 10.00
Machine shop turnings	10.00 to 10.50

San Francisco

SAN FRANCISCO, CAL., Jan. 11, 1916.

Business appears rather less active, but important inquiries are out in nearly all departments, and the small shop trade is in very good shape for this time of year. There is a rather urgent export demand, but most of the mills are disposed to take care of their local trade first. Stocks in some lines are beginning to show depletion, and prices continue to advance.

Bars.—While specifications have been going in freely for some time, local merchants are beginning to run short of some sizes, and mills are getting considerable small business for prompt delivery from stock. Export buyers find some difficulty in placing their orders. Local mills have had a fair business for future delivery, and still have a substantial tonnage to offer for second quarter, for which they are asking about 2.60c. The jobbing price for small lots is about 3.05c. The California Iron & Steel Company, Los Angeles, which succeeded the California Industrial Company, has just started up its new 30-ton open-hearth furnace, and will be turning the increased product into bars within another month. This plant had formerly been running only a 15-ton furnace.

Structural Material.—Dyer Bros. have taken a contract for the California & Hawaiian Sugar Company's warehouse, Crockett, Cal., about 800 tons, and a small job for the American Trona Company at San Pedro. The McClintic-Marshall Company has three small bridges in Washington. The Palm Iron Works, Sacramento, has the hall of justice in that city, erroneously

reported let to another firm. No plans of special importance have appeared, though a number are in the hands of architects. Preliminary arrangements are being made for a large addition to Lane Hospital, this city.

Rails.—Recent business has been rather light, but arrangements are being made to resume logging operations on a large scale all along the coast, in view of which an active movement is expected for the next few months. There are also numerous inquiries from the mining districts. Some small export orders have been placed.

Plates.—New shipbuilding business continues to appear, with many plants enlarging their scope of operations and some new concerns opening. The demand is accordingly fully maintained, with large inquiries appearing nearly every week. General shops are also buying more freely than for some time. Merchants are still fairly well supplied on old contracts, but on new business, where any reasonable delivery is desired, plates cost about 3.25c., landed in San Francisco by rail, the jobbing price being 3.35c.

Sheets.—Galvanized sheets find about the normal demand for the season, with indications of more activity in the near future. Prices show a wide variation. While the larger interests are very firm, offerings have lately appeared for early shipment at lower prices. Blue annealed, especially the heavier gages, are in fairly active demand. Buyers are not disposed to stock up heavily on galvanized, owing to the uncertain outlook.

Wrought Pipe.—The year has opened with a gratifying improvement in the demand for oil-country goods, which are expected to continue active. The recent advance has also stimulated buying of the smaller sizes, stocks of which are being filled in fairly well. With good deliveries and prospects of lower rates by the Panama Canal in a few months, however, there is little speculative buying.

Cast-Iron Pipe.—A fair tonnage has been sold on small orders, and inquiries are due shortly from some municipal projects. The town of Glendale has taken a couple of cars of 6 and 8 in. Whittier, Cal., has plans under way for a \$100,000 waterworks system. Prices are quoted at \$34 per net ton for 6-in. and over; \$36 for 4-in., and \$1 extra for class A and gas pipe.

Pig Iron.—A shipment of nearly 2000 tons of Hangyang basic and foundry iron, mostly under contract, came in recently. Foundry work shows considerable improvement, and steel-making requirements are probably larger than ever before in this district. Sales of Eastern and Southern iron are accordingly increasing. No. 1 Southern foundry iron is quoted here at \$26.50, per gross ton, with special analysis irons higher. Sales of high-silicon iron are reported as high as \$29.

Coke.—Two shipments, totaling nearly 2000 tons, of Australian coke arrived recently, but this is not available for foundry use. The local demand is growing, and a number of consumers have placed large contracts lately for various brands of Eastern coke. Prices have advanced, being quoted here at about \$16 per net ton. Local steel plants use little coke, finding a fair substitute in carbon briquets from the gas works.

Ferroalloys.—Ferromanganese has again advanced, a shipment due to arrive from England in April being held at \$130 per ton. Ferrosilicon is quoted at \$150 for February-March delivery. There has been a marked development of manganese and chrome ore deposits in California in the last few months, and a considerable tonnage is being sold for shipment East.

Old Material.—Reports on the scrap market from different sources show a wide divergence. With an unprecedented demand for steel scrap, dealers are inclined to take a firm view, and one dealer claims that sales have been made at \$15 per gross ton. The principal buyers, however, regard \$11 as an outside figure, and an offer even of \$10 is said to have brought out larger accumulations than were thought to exist. There is a great quantity of material scattered through the country and neglected on account of high freight rates, which would be available with a slight advance in prices. While there is a little more demand for cast-iron scrap,

there seems to be quite a large tonnage accumulated, and prices have eased off, the general range being from \$12 to \$14 per net ton.

The San Francisco office of the Yale & Towne Mfg. Company, now located in the Rialto Building, is to be discontinued, after being maintained here for 27 years. The reason given is the taxation under the California corporation law. The agency will be handled by the local hardware firm of Charles Brown & Sons, Inc., 871 Market Street.

New York

NEW YORK, Jan. 19, 1916.

Pig Iron.—New inquiries are fewer and most of the business that has been done since the opening of the year has been due to the activities of salesmen in offering their product. The embargo in New England has reached a more acute stage in the last week and what is most disturbing is that the New Haven road may not fully extricate itself from its difficulties for weeks. The pig iron situation is most serious, but by fits and starts there is also an embargo on coke. This latter has been effective on the Pennsylvania Railroad and has applied to Jersey City and to lighterage operations. On Jan. 14 it was declared off by the Pennsylvania Railroad. The situation in respect to pig iron deliveries in New England is complicated. Water shipments have been resorted to as a means of reaching Sound points and in a few cases there have been shipments on the New Haven road, particularly to New Bedford and Providence, while Rutland, Vt., has been reached by way of the Delaware & Hudson. Several New England foundries are reported on the verge of shutting down. Recent sales include 2500 tons of No. 2 X foundry to Poughkeepsie, deliveries in the second half; 1000 tons to Irvington, deliveries in the second and third quarter; 1800 tons to Elizabeth, N. J., divided among three eastern Pennsylvania producers, and 800 tons to Brooklyn for second quarter delivery. What have been asking prices are not maintained and in one Hudson River transaction in which Cleveland and Buffalo furnaces were sellers, the iron went at less than \$18 Buffalo for No. 2 X. A sale of eastern Pennsylvania is reported at \$19.50 delivered in Brooklyn. The International Steam Pump Company is in the market for 10,000 tons of foundry coke for its various plants, deliveries to be made in the year beginning July 1. Coke producers are not eager for business so far in the future. We quote at tidewater as follows for early delivery: No. 1 foundry, \$20.25 to \$20.75; No. 2 X, \$19.75 to \$20; No. 2 plain, \$19 to \$19.25. Southern iron at tidewater, \$20 to \$20.50 for No. 1 and \$19.50 to \$20 for No. 2 foundry and No. 2 soft.

Ferroalloys.—The ferromanganese market is stiffer and consumers show more concern about future supplies. With one prominent British representative out of the market until well into the second quarter and with one domestic producer out of blast for the last two months, the situation is not as reassuring as two or three months ago. Receipts from England are apparently decreasing, while the imports for 1915 are estimated at not much over 55,000 tons, compared with normal importations of over 100,000 tons per year. The British alloy is still quoted at \$125, seaboard, at which figure a few sales of small lots are reported, with inquiries for 1000 tons and for small lots. Nearly all the metal coming in is being delivered on old contracts, leaving very little available for sale, though several resales are reported at \$150. One owner is holding a resale lot at \$175. Domestic ferromanganese is quoted at \$125 upward, furnace, depending on the needs of the consumer, but not much is available as it is understood that domestic producers are sold up until July 1 at least. A third cargo of Cuban manganese ore is expected this month. Cuban ore is selling at 52 to 53c. per unit, seaboard, with Brazilian ore at 56c. to 58c. Spiegel-eisen, 20 per cent, is not obtainable for delivery much before July 1 at less than \$31, furnace, with higher percentages selling readily above this figure, several

such sales having been made recently. Ferrosilicon, 50 per cent, is quoted at \$84 to \$86, Pittsburgh, with the demand and consumption unprecedented. A new domestic producer is finding a ready market for its product, estimated at 10,000 tons per year. We note sales and contracts at \$90 to \$96 per ton.

Finished Iron and Steel.—The congestion of shipping for export has extended very definitely to certain lines affecting domestic business, and the seriousness of the situation is that no guess is hazarded as to when permanent relief is likely. The lifting of embargoes merely starts rush movements which bring a return of congestion. The result is that manufacturers on seaboard and in parts of New England are worried over receipts of raw materials; in a few cases these have barely allowed operation in some departments. The developments in the plate market are also fast bringing on an unusual condition. Plates are commonly quoted at 2.50c., Pittsburgh, from eastern Pennsylvania mills, but deliveries from these sources are fast getting as extended as those from Pittsburgh, so that instead of there being two scales of prices, one for long-deferred delivery and another for somewhat prompt shipment, practically only remote shipment material is obtainable, and this at prices which show a range of \$13 and over per ton between high and low. Warehouses naturally get the prompt demand business which is no higher than the higher mill prices, and the deliveries are of course immediate. Some plate business is done, however, from mills at 2.35c., Pittsburgh, in five and more weeks, and one case of 2.10c., Pittsburgh, is noted in about this delivery. The quotation of 2.50c., Pittsburgh, is for deliveries hardly before July 1, while 2c., Pittsburgh, is regarded as good for third quarter, though contracts for such business are not sought. Demand for shipbuilding material is heavy and railroad car buying is looking up, with purchases, for example, by the Pennsylvania after decrying the high prices of bids some two months ago, and the Illinois Central has the matter again under consideration. The structural demand has not yet broadened and fabricators need work; but much hope is placed on early spring developments. The scale of operations is indicated in the jobs closed, such as 200 tons for the Lenox telephone exchange addition, awarded Eidlitz & Ross; 150 tons for a garage on East Fifty-seventh Street, awarded to the George A. Just Company and 400 tons for the Sissons stores at Binghamton, awarded to the Binghamton Bridge Company. Another large project has come out in Philadelphia of several thousand tons for an office building for the Baldwin Locomotive Works, which has been placed with the McClintic-Marshall Company. We quote mill shipments of steel bars at 2.169c. and higher for moderately prompt deliveries; plates, 2.519c. to 2.669c., New York; structural shapes at 2.069c. and higher, New York, and iron bars at 2.219c. to 2.269c., New York. For warehouse buying we quote iron and steel bars and structural material at 2.50c. and steel plates at 2.60c.

Cast-Iron Pipe.—Bids are being opened to-day by the city of Baltimore, Md., on 5810 tons of 1½ to 48-in. pipe. Only a small quantity is needed of the largest and smallest sizes. Specifications mainly call for 6, 10, 12, 16, 20 and 30 in. Bids are also being opened to-day by New Britain, Conn., on 155 tons. Lynn, Mass., opens bids to-morrow on 700 tons and Brookline, Mass., on Friday for 481 tons. The increase in municipal lettings confirms the expectations of the trade as given in the reports of the past few weeks. Private buying keeps up very well, and a little more is being done in contracting for export. Some good-sized inquiries are now out for export business. Prices exhibit an upward tendency, although occasionally keen competition develops over some specially attractive order. Carload lots of 6-in. class B and heavier, are quoted at \$29 per net ton, tidewater, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—Heavy melting steel scrap is quiet, but in other grades a fair business is being done. The better range of prices now ruling in eastern Pennsylvania appears to render unnecessary the continuance of quotations on two grades of steel scrap in this market. The diversion of exports of old steel car axles to other

shipping ports, because of the congestion of railroads here, has brought about a lower level of prices in this vicinity. Wrought turnings are in such superabundant supply that they have sold much below the prices that can be secured on cast borings. Old carwheels are stronger. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

No. 1 heavy melting steel scrap.....	\$14.00 to \$14.50
Relaying rails	22.50 to 23.50
Rerolling rails	15.00 to 15.50
Iron car axles.....	25.00 to 25.50
Steel car axles.....	23.50 to 24.00
No. 1 railroad wrought.....	20.00 to 20.50
Wrought-iron track scrap.....	17.50 to 18.00
No. 1 yard wrought, long.....	15.50 to 16.00
No. 1 yard wrought, short.....	14.00 to 14.50
Light iron	6.25 to 6.50
Cast borings	8.50 to 8.75
Wrought turnings	7.50 to 7.75
Wrought pipe	13.50 to 14.00
Old carwheels	14.00 to 14.50
Malleable cast (railroad).....	12.50 to 13.00

The market on cast scrap continues strong and prices are slightly higher. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery).....	\$16.50 to \$17.00
No. 2 cast (heavy).....	15.50 to 16.00
Stove plate	11.50 to 12.00
Locomotive grate bars.....	11.50 to 12.00

British Market Nominal

Record Prices for American Billets—Maximum Quotations for Home Trade

(By Cable)

LONDON, ENGLAND, Jan. 19, 1916.

Cleveland pig-iron warrants are firm and business is fair with transportation and labor problems increasingly acute. Makers' iron is scarce and withdrawals from stores continue. Hematite iron is stiffer with the minimum quotation about 135s. and little available for the first half of this year. Maximum prices are being fixed for the home trade but there is much mystery about them. Welsh bars are understood to be officially quoted at £10 7s. 6d., based on hematite iron at £6 10s. 6d. Welsh bars, however, have sold at £12 5s., east coast. Plates are officially quoted at £11 10s., angles at £11 12s. 6d. and joists at £11 2s. 6d., but these prices are nominal based on hematite iron at £6 2s. 6d. Tin plates are firm at 25s. 6d. and upwards.

American 4-in. billets have sold at \$60 c.i.f. Liverpool. Quotations which are mostly nominal are as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 25s. 6d. upwards, compared with 25s. 6d. to 25s. 9d. one week ago.

Cleveland pig iron warrants, 80s., against 78s. 3d. last week.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 76s. 9d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £18, against £18 10s. last week.

Steel rails, export, f.o.b. works port, £11 5s. nominal.

Hematite pig iron, f.o.b. Tees, about 135s., against 130s. a week ago.

Ferromanganese, f.o.b., £25, loose.

Ferrosilicon, 50 per cent, c.i.f., £27.

Highest Prices Since 1873—Serious Effect of Government Control

(By Mail)

LONDON, ENGLAND, Dec. 30, 1915.—The year closes with extraordinary and unparalleled conditions in all departments of the British iron and steel trades. From depression in prices there has emerged a boom in values which threatens to eclipse anything previously known, but which is nevertheless accompanied by the gradual stifling of all private enterprise. Not the least remarkable of the features which have developed as the outcome of the great war is the general control of all industrial establishments, a control which is more marked in the metallurgical branches than almost anywhere else. This government control, which would have appeared a fantastic socialistic scheme even a twelve-month ago, is now accepted as part of the war machinery of the country and certainly opens a wide field

of possibilities and new developments when once peace conditions are restored. Prices in all directions have reached a level unsurpassed since 1872-73, when the repairing of the destruction wrought by the Franco-Prussian war caused prices to be lifted to figures not yet attained. The destruction effected during that period, however, was trifling compared with that which will have to be repaired some time in the next decade.

The pig-iron trade is being closely regulated now by the state, and it is believed that with the New Year practically all the blast furnaces will come under government control while already, as previously intimated to you by cable, maximum prices have been tentatively arranged for certain raw materials. There are great difficulties in the way of bringing this about on an equitable basis, but no doubt an orderly plan will emerge from the present confusion. The exportation of hematite pig iron has already been forbidden, and has much disturbed export merchants. Representations have been made to the authorities by Glasgow firms to which the Secretary of the War Trade Department replied that hematite pig iron entered for shipment on or before Dec. 20 or on or before that date waiting at the quay for shipment, or being conveyed to the vessel, may be exported without license, but that for all other shipments licenses must be obtained. This is read as being a relaxation of the original notice which was interpreted as being that shipments of hematite were entirely prohibited. The whole of the pig-iron output of the country seems to be wanted for war purposes, merchant trade and general consuming business being relegated to a secondary position.

In finished steel prices have been moving up regularly recently, although there is not a great deal of business with which to test actual figures. There is no disposition to sell material far ahead, and makers are considering whether the present is not an opportune time for instituting alterations in trade customs, which are believed to have become obsolete. At all events, the iron masters in the Midlands are considering whether or not the discount for cash payments at one month might not be dropped and the local extras be brought into conformity with those ruling in other districts. Probably something will be done, though the matter has not yet been definitely arranged.

EFFECT OF GOVERNMENT RESTRICTIONS

In semi-finished steel serious famine conditions prevail and the ultimate issue is beyond all guesswork. The entire steel output is required for government use, and this is bound to involve an ever-shrinking proportion of raw steel available for conversion into semi-finished and finished forms of merchant material. The tin-plate trade is particularly feeling the effect of this state of things, and it is becoming more and more difficult for the mills to carry on their business. The galvanized sheet trade is in pretty much the same condition, though here the question of spelter enters largely. As for Welsh bars it is almost impossible to know the price at which substantial quantities could be booked. The official price is £9 10s., delivered to local consumers, but actual sales have been made at over £12, with only a few hundred tons obtainable. And with the beginning of the year, too, all the tin-plate works have come under government control, which further complicates matters.

It is impossible to give quotations on finished steel. Works can quote only on small lots, larger amounts having first to be referred to the authorities for permission. Markets are, therefore, entirely nominal. Joists are possibly about £12 to £13 f.o.b., but nobody will quote, although a small stock lot was booked lately at about the lower figure. Angles, tees and bars are all in the same position, and although the rail makers are still nominally quoting £11 5s. for heavy sections f.o.b. they are not at liberty to sell, and the railroads are equally discouraged from placing new business.

It almost seems that after eighteen months of mud-
dle and mismanagement, to say nothing of the horrible
bloodshed involved owing to the grossest incompetence,
the authorities are at last beginning to turn their
attention to the serious business in hand. Meantime
the general business here gets daily upon a narrower

basis and, with the enormous drain upon the manhood of the country, a drain which is widening from day to day, we are coming within sight of the period when our industrial establishments from end to end will be manned by old men and the medically unfit.

Iron and Industrial Stocks

NEW YORK, Jan. 19, 1916.

While the stock market has not been strikingly active, the tendency of prices has steadily been upward, with some stocks showing marked gains as compared with the previous week. United States Steel stocks have not shown as much of an advance as the minor industrials. Indications are seen of some revival of interest in stocks of companies having war orders. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal. com.	25	- 29 1/2	Ry. Stl. Spring.	
Allis-Chal. pref.	78 1/2	- 80 1/2	pref.	99 1/2
Am. Can. com.	61	- 64 1/2	Republic, com.	50
Am. Can. pref.	112 1/2	- 113 1/2	Republic, pref.	108
Am. Car & Fdy. com.		64 1/2 - 72	Sloss, com.	58 1/2 - 62
Am. Car & Fdy. pref.	118	- 118 1/2	Sloss, pref.	101
Am. Loco. com.	61	- 67 1/2	Pipe, com.	21 1/2 - 22 1/2
Am. Loco. pref.	100 1/2	- 102	Pipe, pref.	50
Am. Steel Fdries.	54 1/2	- 59 1/2	U. S. Steel, com.	85
Bald. Loco. com.	103 7/8	- 114	U. S. Steel, pref.	117 1/2 - 117 1/2
Bald. Loco. pref.	107 1/2	- 108	Va. I. C. & Coke.	60
Beth. Steel. com.	420	- 493	West. Electric.	65
Beth. Steel. pref.	141	- 143 1/2	Am. Rad. com.	390
Case (J. L.) pref.	86	- 88 1/2	Am. Ship. com.	33
Colorado Fuel.	45 1/2	- 49 1/2	Am. Ship. pref.	76
Deere & Co. pref.	96	- 96 1/2	Chic. Pneu. Tool.	74
Gen. Electric.	170 1/4	- 178 1/4	Cambr. Steel.	73 1/2 - 75 1/2
Gt. No. Ore Cert.	47 1/2	- 49 1/2	Lake Sup. Corp.	8 1/2 - 9 1/2
Int. Harv. of N. J. com.		108 1/2 - 110 1/2	Pa. Steel, pref.	80 1/2 - 81
Int. Harv. of N. J. pref.	117	- 119 1/2	Warwick.	10 1/2
Int. Harv. Corp. com.		74	Cruc. Stl. com.	52 1/2 - 70 1/2
Int. Harv. Corp. pref.		108	Cruc. Stl. pref.	109 - 111
Lackawanna Stl.	81 1/2	- 85 1/2	Harb.-Walk. Refrac. com.	73 - 75
Nat. En. & Stm. com.		26 1/2 - 28 1/2	Harb.-Walk. Refrac. pref.	100
Nat. En. & Stm. pref.		92	La Belle Iron, com.	51 1/2 - 52
N. Y. Air Brake.	142 1/2	- 153 1/2	La Belle Iron, pref.	123
Pitts. Steel, pref.	98	- 100 1/2	Am. Brit. Mfg. com.	20 - 39 1/2
Pressed Stl. com.	57	- 61 1/2	Am. Brit. Mfg. pref.	65
Pressed Stl. pref.		104	Can. Car & Fdy. com.	69 - 75
Ry. Stl. Spring. com.		37 1/2 - 41 1/2	Can. Car & Fdy. pref.	83 - 95
			Driggs-Seabury	130 - 152
			Midvale Steel.	69 - 73 1/2

Dividends

The J. G. Brill Company, regular quarterly, 1 per cent on the preferred stock, payable Feb. 1.

The Sullivan Machinery Company, quarterly, 1 1/2 per cent, payable Jan. 15, thereby increasing its dividend rate from 4 to 6 per cent.

The Crocker-Wheeler Company, regular quarterly, 1 1/2 per cent on the common and 1 1/2 per cent on the preferred stock, payable Jan. 15.

The Keeley Stove Company, Columbia, Pa., regular annual, 10 per cent and an extra of 10 per cent from the surplus earnings of the past year.

The International Harvester Company and International Harvester Corporation, each, regular quarterly, 1 1/2 per cent on the preferred stock, payable March 1.

The Willys-Overland Company, regular quarterly, 1 1/2 per cent on the common stock, payable Feb. 1.

Reports of the Swedish steel trade at a recent meeting of the Swedish Ironmasters' Association late in October were that orders were plentiful and prices firm, though there was still difficulty in obtaining sufficient fuel and other necessary raw material. The pig-iron output to Nov. 1, 1915, was 629,200 metric tons, including direct castings, which was 68,100 tons greater than for the same 10 months in 1914. Exports of pig iron to Nov. 1, 1915, were 483,700 tons, against 313,200 to Nov. 1, 1914; imports for the same periods were 219,700 tons and 213,300 tons respectively. On Oct. 31, 1915, there were in operation 102 blast furnaces, 164 Lancashire hearths, 13 Bessemer converters and 66 open-hearth furnaces.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 73.9c. on plates, structural shapes and sheets and 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal is 56.9c.

Structural Material.—I-beams, 3 to 15 in.; channels, 1 to 15 in.; angles, 3 to 6 in. on one or both legs, $\frac{1}{4}$ in. thick and over, and zees 3 in. and over, 1.90c. to 2.25c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than $\frac{1}{4}$ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	.155
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, $\frac{1}{4}$ in. thick, 6 $\frac{1}{4}$ in. up to 100 in. wide, 1.90c. to 2.25c., base, net cash, thirty days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, $\frac{1}{4}$ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered $\frac{1}{4}$ -in. plates. Plates over 72 in. wide must be ordered $\frac{1}{4}$ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3/16 in. take the price of 3/16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

	Cents per lb.
Gages under $\frac{1}{4}$ in. to and including 3/16 in.	.10
Gages under 3/16 in. to and including No. 8.	.15
Gages under No. 8 to and including No. 9.	.25
Gages under No. 9 to and including No. 10.	.30
Gages under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates), 3 ft. and over.	.10
Complete circles, 3 ft. in diameter and over.	.20
Boiler and flange steel.	.10
"A. B. M. A." and ordinary firebox steel.	.20
Still bottom steel.	.30
Marine steel.	.40
Locomotive firebox steel.	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	.155
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Wire Rods.—Bessemer, open-hearth and chain rods, \$45, nominally.

Wire Products.—Prices to jobbers: Fence wire, Nos. 0 to 9, per 100 lb., terms sixty days or 2 per cent discount in ten days, carload lots, annealed, \$1.95; galvanized, \$2.65. Galvanized barb wire and staples, \$2.95; painted, \$2.25. Wire nails, \$2.10. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Woven wire fencing, 67 1/2 per cent off list for carloads, 66 1/2 off for 1000-rod lots, 65 1/2 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.									
Nos. 0 to 9	10	11	12 & 12 1/2	13	14	15	16		
Annealed	\$2.00	\$2.05	\$2.10	\$2.15	\$2.30	\$2.40	\$2.50	\$2.60	
Galvanized	2.90	2.95	3.00	3.05	3.10	3.25	3.60	3.70	

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from Jan. 4, 1916, on iron and steel black and galvanized pipe, all full weight:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
$\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$	70	45 1/2	$\frac{1}{8}$ and $\frac{1}{4}$	60	34
$\frac{1}{2}$	74	58 1/2	$\frac{1}{2}$	61	36
$\frac{3}{4}$ to 3	77	62 1/2	$\frac{1}{2}$	65	45
			$\frac{3}{4}$ to 1 $\frac{1}{2}$	68	50
			2	67	50

Lap Weld		
2	74	59 1/2
2 $\frac{1}{2}$ to 6	76	61 1/2
7 to 12	74	57 1/2
13 and 14	60 1/2	2 $\frac{1}{2}$ to 4
15	58	4 $\frac{1}{2}$ to 6
		7 to 12

Reamed and Drifted		
1 to 3, butt	75	60 1/2
2, lap	72	57 1/2
2 $\frac{1}{2}$ to 6, lap	74	59 1/2

Butt Weld, extra strong, plain ends		
$\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{8}$	66	49 1/2
$\frac{1}{2}$	71	58 1/2
$\frac{3}{4}$ to 1 $\frac{1}{2}$	75	62 1/2
2 to 3	76	63 1/2

Lap Weld, extra strong, plain ends		
2	72	57 1/2
2 $\frac{1}{2}$ to 4	74	59 1/2
4 $\frac{1}{2}$ to 6	73	58 1/2
7 to 8	67	50 1/2
9 to 12	62	45 1/2

Butt Weld, double extra strong, plain ends		
$\frac{1}{2}$	61	48 1/2
$\frac{3}{4}$ to 1 $\frac{1}{2}$	64	51 1/2
2 to 2 $\frac{1}{2}$	66	53 1/2

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Sheets.—Makers' prices for mill shipment on sheets, of U. S. standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms thirty days net, or 2 per cent cash discount in ten days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	2.35 to 2.45
Nos. 9 to 10	2.40 to 2.50
Nos. 11 and 12	2.45 to 2.55
Nos. 13 and 14	2.50 to 2.60
Nos. 15 and 16	2.60 to 2.70

Box Annealed Sheets, Cold Rolled

Nos. 10 and 11	2.25
No. 12	2.25
Nos. 13 and 14	2.30
Nos. 15 and 16	2.35
Nos. 17 to 21	2.40
Nos. 22 and 24	2.45
Nos. 25 and 26	2.50
No. 27	2.55
No. 28	2.60
No. 29	2.65
No. 30	2.75

Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	3.75 to 4.00
No. 12	3.85 to 4.10
Nos. 13 and 14	3.85 to 4.10
Nos. 15 and 16	3.95 to 4.20
Nos. 17 to 21	4.10 to 4.35
Nos. 22 and 24	4.30 to 4.55
Nos. 25 and 26	4.45 to 4.70
No. 27	4.60 to 4.85
No. 28	4.75 to 5.00
No. 29	4.90 to 5.15

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap-welded steel tubes and standard charcoal-iron tubes, effective from Jan. 7, 1916, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
1 $\frac{1}{2}$ in.	45	1 $\frac{1}{2}$ in.	40 to 45
1 $\frac{3}{4}$ and 2 in.	57	1 $\frac{3}{4}$ and 2 in.	44 to 45
2 $\frac{1}{4}$ in.	54	2 $\frac{1}{4}$ in.	41 to 42
2 $\frac{1}{2}$ and 2 $\frac{3}{4}$ in.	60	2 $\frac{1}{2}$ and 2 $\frac{3}{4}$ in.	48 to 49
3 and 3 $\frac{1}{4}$ in.	65	3 and 3 $\frac{1}{4}$ in.	52 to 53
3 $\frac{1}{2}$ to 4 $\frac{1}{2}$ in.	66	3 $\frac{1}{2}$ to 4 $\frac{1}{2}$ in.	54 to 55
5 and 6 in.	59	5 and 6 in.	48 to 49
7 to 13 in.	56		

Locomotive and steamship special charcoal grades bring higher prices.

1 $\frac{3}{4}$ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

Copper, New York	Electro-	Tin,	Lead—		Spelter—	
			New	St.	New	St.
Jan. 24.00	23.62½	40.87½	5.90	5.70	17.50	17.25
12.	24.00	23.62½	41.00	5.90	17.62½	17.37½
13.	24.00	23.62½	41.00	5.90	17.87½	17.62½
14.	24.00	23.62½	40.87½	5.90	18.00	17.75
15.	24.00	23.62½	40.87½	5.90	18.00	17.75
17.	24.00	23.62½	40.75	5.90	18.50	18.25
18.	24.00	23.62½	40.75	5.90	18.50	18.25

NEW YORK, Jan. 19, 1916.

Copper is quiet but first hands maintain their prices. Tin is dull and lower. Lead is somewhat irregular because of foreign influences. Spelter has shown more life and has advanced. Antimony is stronger.

New York

Copper.—The market has been extremely dull with business confined to comparatively small lots of resale metal. The electrolytic producers have adhered to their quotation of 24c., full terms, with one quoting 24.25c. Plenty of copper can be obtained, however, at 23.62½c., cash, New York, and a few days ago small sales were made at less. Lake is nominal at 24c. Consumers are well covered for the first quarter, and the producers are in a very comfortable position with the orders they have on their books. The exports this month, including yesterday, total 12,665 tons. Statistics from Europe show that the copper stocks in both the United Kingdom and in France are steadily declining. Their total Jan. 15 was 11,681 tons, against 12,341 tons at the end of 1915. The base price of sheet copper has been advanced to 30.50c., although the leading manufacturers are not publishing any price.

Tin.—There has been an almost total absence of activity, a condition attributed last week to the slow working of the cables. This week there has been an improvement in this respect, yet business has been almost as quiet. The trouble with the cables was due to the rigid censorship exercised by the British authorities, not always with good judgment, which ultimately caused a congestion of messages. The arrivals of the month have already reached 3100 tons and there is 5715 tons afloat, so supplies are ample, a fact which probably accounts for the easier price. The quotation for spot tin yesterday was 40.75c.

Lead.—Despite the announced intention of the British Government to control the buying and selling of lead in the home market, the leading American producer has held to its quotation of 5.90c., New York. When the news came out that the British trade would be regulated it had an adverse effect on prices here and abroad, but this week London has shown some improvement and the market here has a better tone. As a matter of fact there has not been much buying and the changes in prices have been slight. It was the tone of the market that changed. There have been some large inquiries from Russia and Japan, but it does not appear that buying resulted. Producers are well booked with orders and inasmuch as buyers are well supplied the outlook for the near future is uncertain. The New York quotation yesterday was 5.90c. and that at St. Louis 5.70c. The total exports so far this month, including yesterday, were 3355 tons.

Spelter.—About the middle of last week an advance in quotations was inaugurated by a strong demand for spot and nearby metal, as a result of which prices have advanced 1c. per lb. since that time. The spot demand was caused by a shortage at New England mills whose shipments from the West were tied up by the freight embargo on several of the railroads, notably the New York, New Haven & Hartford. Some consumers were so short of spelter that they had large quantities shipped to them by express. There is still a good demand for January, February and March deliveries, and

not a great deal to be had of any position. The spot quotations yesterday were 18.50c., New York, and 18.25c., St. Louis. February is about 17.75c., St. Louis, and March, 16.75c. The exports this month, including yesterday, total 2852 tons.

Antimony.—The scarcity of spot continues and quotations are higher at 42c. to 42.50c., for Chinese and Japanese. Metal to arrive in February is quoted at 34.25c. to 34.50c. in bond. American antimony is quoted at the same level as that from the Far East.

Aluminum.—The market is quiet at 53c. to 55c. for No. 1 aluminum, 98 to 99 per cent pure. The explanation of the easier prices in the past few days is that Great Britain is restricting foreign shipments through her determination to keep the metal out of enemy hands and shippers do not want to risk seizure.

Old Metals.—The market is higher and firm. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible	21.00 to 22.00
Copper, heavy and wire	20.50 to 21.00
Copper, light and bottoms	18.00 to 18.50
Brass, heavy	13.00 to 13.50
Brass, light	11.00 to 11.50
Heavy machine composition	15.50 to 16.00
No. 1 yellow rod brass turnings	14.00 to 14.50
No. 1 red brass or composition turnings	14.50 to 15.00
Lead, heavy	5.25
Lead, tea	5.00
Zinc	12.00 to 14.00

Chicago

JAN. 17.—The strength of the copper situation is manifested in the further advance in prices. Sheet zinc and spelter are likewise higher. We quote: Casting copper, 23c.; Lake copper, 24c.; tin, carloads, 41½c., and small lots, 43½c.; lead, 5.75c. to 5.85c.; spelter, 18.25c.; sheet zinc, nominally, 23c.; Cookson's antimony, 50c.; other grades, 45c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 17.75c.; copper bottoms, 17c.; copper clips, 17.75c.; red brass, 16c.; yellow brass, 14c.; lead pipe, 4.90c.; zinc, 13.50c.; pewter, No. 1, 25c.; tinfoil, 33c.; block tin pipe, 37c.

St. Louis

JAN. 17.—Non-ferrous metals are quiet but firm, with lead at 6c.; spelter, 18.50c.; tin, 44c.; Lake copper, 24c.; electrolytic copper, 23.75c.; antimony, 46c. In the Joplin ore district the basis range for zinc blende during the week was \$85 to \$110 per ton, with top settlements at \$113. Calamine ranged from \$70 to \$80 for 40 per cent. Lead ore sold at \$72 for 80 per cent. The average for the week's production for the district was: Zinc blende, \$93; calamine, \$73; lead, \$72. Miscellaneous scrap metals are quoted as follows: Light brass, 8c.; heavy yellow brass, 10.50c.; heavy red brass, 11c.; heavy copper and copper wire, 14c.; zinc, 8c.; lead, 4c.; pewter, 22c.; tinfoil, 30c.; tea lead, 3.50c.

Locomotive Orders and Inquiries

Locomotive orders thus far in January amount to about 55 while inquiries aggregate 60. The Indiana Harbor Belt Line has ordered 20 Mikado and 10 switching locomotives; the Delaware, Lackawanna & Western, 17, and the New York Central 5, all from the American Locomotive Company. The Illinois Central is reported inquiring for 20 locomotives, the Southern Pacific for 20, the Union Pacific for 10 and the Canton & Hankow (China) for 10.

Statistics for the zinc and lead district centering at Joplin, Mo., show that the year 1915 saw a total production of zinc blende and calamine ore of 309,648 net tons, an increase over 1914 of 52,574 tons. It was 8000 tons higher than the best previous record, which was in 1912. The 1915 output was sold for \$23,541,585 as compared with \$9,853,936, an increase in value of 140 per cent against an increase in production of only 20 per cent. The lead ore output of the district in 1915 was 46,039 net tons, an increase of 4675 tons over 1914. The 1915 output sold for \$2,514,765, against \$1,919,298 for the 1914 output.

OIL-BURNING CUPOLAS

Results of Recent Practice with the Stoughton Process

"The Use of Crude Oil for Cupola Melting" was the subject of a paper by Bradley Stoughton, the inventor of the process, before the Pittsburgh Foundrymen's Association, Monday evening, Jan. 17. Reference to the patent on this process was made in THE IRON AGE, Feb. 25, 1915, and an article in the issue of May 13, 1915, described some early practical results in a steel converter foundry near Philadelphia. Further points given in a paper by the inventor before the American Foundrymen's Association at Atlantic City in October, 1915, were presented in these columns Oct. 14, 1915.

Some of the more recent results of investigations and of practical applications of the process were given at the Pittsburgh meeting this week by Mr. Stoughton, as well as a somewhat fuller discussion of the three basic principles on which the success of the process depends. As to recent results the speaker said:

At a plant near Philadelphia, which has been running ten months, they find that the practical operation and regulation of the oil cupola is simpler and easier than the ordinary coke cupola.

A plant in San Francisco was started in the middle of October, 1915, but it was impossible for any one who had had previous experience, or who had even seen an oil cupola, to be present when this cupola was started up. The result was that it was operated very cautiously, using a large amount of coke above the bed at first and gradually reducing it until somewhat more than three-fourths of the coke had been replaced with oil. One month after the cupola was started our representative in San Francisco wrote: "I have at last come to the point where I am entirely satisfied with my installation and method of operation, and feel as much at ease with the oil burning cupola as I would be were we using coke fuel."

RESULTS OBTAINED

In the cupola near Philadelphia which has been operating since March 15, 1915, it has been found that good hot iron can be obtained with the expenditure of 60 lb. of coke and 7½ gal. of oil to the ton of iron melted. This iron is hot enough for all foundry purposes, but may be made much hotter if desired by the use of a small increased amount of oil. At the cupola in San Francisco good iron has been obtained with 50 lb. of coke and 6 gal. of oil per ton of iron melted, but a more satisfactory result is obtained by the use of 65 lb. of coke and 6 gal. of oil per ton of iron melted.

When the process was first devised the object was to save in the cost of fuel by replacing coke with oil, but a few months' experience has shown us that although this saving in the price of fuel is very important in many places, a far greater advantage is the saving in the amount of sulphur absorbed by the iron.

The writer has made a study of sulphur absorption in the ordinary cupola process. In the year 1898 an extensive test was made on a number of cupolas during a week's operation. This involved the making of many hundred analyses and showed a very variable absorption of sulphur by the iron, about a total average for all cupolas for the week of 0.025 per cent of sulphur added to the metal during the melting process. In other words, iron which contained before melting 0.055 per cent sulphur would contain, after melting, 0.080 per cent sulphur. The coke used in this test was a very good grade of Connellsville coke containing a maximum of 0.50 per cent sulphur. The melting ratio was 1:10, including the bed, and limestone was used. The manganese was 0.50 per cent. The writer has heard of better results than this having been obtained, where the coke was chosen with great care and where constant watchfulness maintained the coke ratio at the lowest possible point. We have even been informed of practice for several days at a time showing a sulphur absorption less than 0.020 per cent sulphur, high-manganese iron being used. At the present time, however, when the best Connellsville coke has been ex-

hausted, and when the sulphur in coke is generally much higher than 0.50 per cent, it is not at all unusual for iron to absorb as much as 0.035 per cent, and in many cases 0.050 per cent of sulphur. The previous examples all refer to ordinary coke cupolas.

In our early experiments with the oil cupola, tests showed sulphur absorption of 0.012 per cent. A test recently made at a foundry near Philadelphia showed an absorption of 0.009 per cent sulphur, and a test made for us by Dr. Richard Moldenke showed absorption of 0.008 per cent.

The coke used in each of these last two tests contained 0.76 per cent sulphur; the oil contained 0.60 per cent sulphur, and the cupola slag in one of the tests contained 0.31 per cent sulphur. Limestone was used in the cupola in the two latter examples, but the manganese in the iron was under 0.20 per cent.

Before many months we hope to have a cupola in operation using natural gas instead of oil.

Large Pittsburgh Coal Merger

The Pittsburgh Coal Company of New Jersey and the Monongahela River Consolidated Coal & Coke Company, both having headquarters at Pittsburgh, Pa., are to consolidate under the name of the Pittsburgh Coal Company of Pennsylvania. The combined capital will be \$80,000,000. This is said to be the largest merger for which papers have ever been filed in the State Department at Harrisburg. The shares of the new company will consist of 400,000 preferred and 400,000 common, each of a par value of \$100.

The officers of the new company are: M. H. Taylor, Erie, Pa., chairman of board of directors; W. K. Field, Columbus, Ohio, president; F. M. Wallace, Erie, Pa., J. P. Walsh, Cleveland, Ohio, and J. A. Donaldson, Emsworth, Pa., vice-presidents; F. A. Lemoyne, secretary, and William Miller, treasurer, both of Pittsburgh. The following are the directors: James H. Beal, Pittsburgh; John J. Bishop, Philadelphia; Harry Bronner, New York; J. C. Disert, Hollidaysburg; W. K. Field, Columbus, Ohio; J. B. Finley, William Flinn, D. L. Gillespie, J. D. Lyon, A. W. Mellon and George T. Oliver, all of Pittsburgh; A. J. Miller, New York, and Henry R. Rea.

For several years the Pittsburgh Coal Company has owned a controlling interest in the Monongahela Consolidated, but the latter was operated independently. The official statement regarding the merger, which was approved by the directors Jan. 12, says that if it is approved and accepted by the shareholders, the unnecessary New Jersey corporation will be dispensed with at considerable saving and an adjustment of the preferred stock dividend arrearage of the Pittsburgh Coal Company will be effected.

German Pig-Iron Output for October

The German pig-iron output for October, 1915, is officially reported by *Stahl und Eisen* at 1,076,343 metric tons, against 1,034,124 tons in September, 1915, a gain of 42,219 tons. Production in October, 1914, was 729,822 tons, and in October, 1913, 1,653,051 tons. The October output is the largest since the war started. The production to Nov. 1, 1915, was 9,741,871 tons, against 12,740,710 tons to Nov. 1, 1914. The October output was made up as follows: Foundry iron, 185,306 tons; Bessemer iron, 14,627; Thomas or basic iron, 667,529 tons; steel-making iron and spiegel-eisen, 188,516 tons and forge or puddle iron, 20,366 tons.

German Steel Shipments Less

The November shipments of the German Steel Works Union were 241,750 metric tons against 257,278 tons in October, a decrease of 15,528 tons. These shipments are the lowest of the war period, except those of August, 1914, which were 94,984 tons. The previous low mark was 245,194 tons in September, 1915. The distribution of the November shipments was 69,099 tons of semi-finished steel, 118,942 tons of railroad material and 53,709 tons of shapes. The war's high record was 351,560 tons in March, 1915.

Pittsburgh and Nearby Districts

Last week, at Youngstown, Ohio, the bi-monthly wage adjustment of the puddling scale was made. Sworn returns of the average prices realized in November and December on iron bars showed that puddlers for January and February were entitled to \$6.20 per gross ton for puddling. The rate for November and December was \$5.90. Tonnage rates in bar-iron mills increased from 3 to 8 per cent. The tin-mill settlement was also made last week, and wages for January and February will be on the same basis as for November and December. In the sheet-mill scale, it was found that the average price on shipments for November and December entitled the men to an advance of about 4 per cent in wages for January and February. It will be recalled that in March, 1915, the men employed in sheet mills that signed the Amalgamated scale agreed to accept a reduction of 12 per cent, owing to depressed conditions existing in the sheet trade at that time.

Officials of the Jamison Coal & Coke Company, Oliver Building, Pittsburgh, deny that their company is to be included in the proposed new steel merger embracing the Cambria Steel Company, Lackawanna Steel Company and Youngstown Sheet & Tube Company.

The labor trouble at the by-product coke plant of the Carnegie Steel Company at Farrell, Pa., has been settled, the employees having decided to accept the graded advance in wages announced recently by the United States Steel Corporation.

The monthly meeting of the Pittsburgh Foundrymen's Association was held in the Fort Pitt Hotel, Pittsburgh, on Monday evening, Jan. 17. About fifty members were present, and the meeting was preceded by a dinner. Dr. Bradley Stoughton read a paper on "The Use of Crude Oil for Cupola Melting."* J. E. Williamson, Bellwood, Pa., was elected an active member.

The Carnegie Steel Company blew in its Sharon furnace, at Sharon, Pa., Jan. 14, after relining. The company is now operating 51 of its 59 furnaces.

The American Sheet & Tin Plate Company, Pittsburgh, operates some of its sheet mills on a sliding scale basis. At these mills slight advances in wages are to be made, dating back to Jan. 1. The amount of the advances has not yet been determined, as invoice prices for December shipments of sheets will have to be made up.

The Pittsburgh Knife & Forge Company, 109 Belmont Street, Pittsburgh, announces that, in order to round out its operations, and at the same time get some much needed additional space, it has purchased the drop-hammer business of the Diamond Forging & Mfg. Company, whose plant is immediately adjoining. The first-named company has been making a specialty of solid steel shear knives and car, railroad and mine forgings. The new drop-hammer equipment will be used principally in making automobile and miscellaneous drop forgings.

The *Telegram*, Youngstown, states that the Youngstown district industrial payroll for 1915 was \$29,992,613, against \$28,401,334 the preceding year. The record year for pay distribution in the district was 1913, when \$33,543,815 was paid out by local employers. It is expected that the distribution in the year just begun will substantially surpass that made in 1913. Wages are higher than for some time and many new plants will be operated.

Former office employees at the Dunbar Furnace Company, Dunbar, Pa., which went into the hands of a receiver several years ago, have received checks for their salaries then due. It is said that through the sale of the property to the American Manganese Mfg. Company, it was possible to pay up these outstanding accounts.

The blooming-mill engine in the open-hearth steel plant of the Brier Hill Steel Company, Youngstown,

*An abstract of this paper will be found on another page.

had a break-down on Wednesday of last week, but repairs are being made as fast as possible, and the company expects to have everything going again by the latter part of this week.

The Independent Bridge Company, whose plant is now located on the North Side, Pittsburgh, has bought 11 acres on Neville Island, on which it proposes to build a plant in the near future that will about triple its present capacity. The company makes a specialty of fabricating steel shapes for the construction and repair of movable dams, and in the past few years has filled some large contracts in connection with the slack-watering of the Ohio River.

Edith furnace of the Carnegie Steel Company, Pittsburgh, was put in blast on Saturday, Jan. 15, after being idle about 5½ years. No. 3 furnace at the company's Ohio works, Youngstown, was blown out last week for relining and repairs.

The December net earnings of the Crucible Steel Company of America, Pittsburgh, are unofficially given as \$1,250,000. It is also unofficially stated that January will make equally as good a showing. The company is reported to have secured an order from the British Government for 15,000 9.2-in. shells at \$250 each, or \$3,750,000 for the entire order.

Elmer K. Hiles, secretary of the Engineers' Society of Western Pennsylvania, Oliver Building, Pittsburgh, announces a program covering meetings including March. At the meeting of Feb. 1 a paper will be read on "Pipe," by John A. McCulloch, engineer, galvanizing works, National Tube Company, McKeesport, Pa.

The Pittsburgh Gear & Machine Company, Pittsburgh, with a capital stock of \$20,000, has been incorporated by Frank H. Rea, 1100 North Negley Avenue; John J. Jackson and William C. Rea, to manufacture machinery and to conduct a general foundry and machine shop.

The Flower-Webster-Cutler Company, Tenth and Peach Streets, Erie, Pa., with a capital stock of \$30,000, has been incorporated by Thomas H. Flower, C. J. Webster and D. J. Cutler, to manufacture automobile accessories.

The Adjustable Runner Company, Johnstown, Pa., with a capital stock of \$15,000, has been incorporated by Martin Baretincic, 324 Broad Street, Johnstown, and others, to manufacture adjustable sleigh runners.

New Carnegie Hoop and Bar Mills

The Carnegie Steel Company will proceed to build at once ten merchant bar and hoop mills on property purchased for this purpose some years ago and located 4½ miles north of its Ohio works at Youngstown, and nearly opposite the village of Girard. The size and type of these mills have not yet been decided upon, but they will be electrically driven. The company's Youngstown & Northern railroad, connecting the Ohio works with the property, and used for some years for carrying slag from the Ohio works to the property in order to make a site, will be improved and completely equipped for carrying semi-finished steel from the Ohio works to the new hoop and bar mills. In line with the policy carried out in all its merchant bar mill construction during the past five years, it is the intention of the Carnegie Steel Company ultimately to concentrate its entire manufacture of merchant steel bars on this new site, and also at the steel works at Duquesne, Pa. At present the greater part of the output of hoops and bars is made at Duquesne, some being rolled also at the Painter mills and the Star works, Pittsburgh. The ultimate capacity for the production of steel bars at Duquesne and Girard, as outlined by the company at present, will be about 2,000,000 tons annually, with ample property for extension.

The Royersford Foundry & Machine Company, Royersford, Pa., has built a new warehouse and added two stories to its factory. These extra floors are to be used for the assembling of 10, 14 and 20 in. sensitive drills and emery grinders, which end of the company's business is growing rapidly. The new floor space covers about 12,000 sq. ft.

NEW ENGLAND FREIGHT BLOCK

A Serious Situation for Many Metal-Working Plants

The freight embargo in New England, which has hampered manufacturers in nearly all metal-working lines for the past three weeks, has reached a more acute stage and there is much concern in various industries, the fear being that the situation may grow worse before it is better. A meeting of officers of the New York, New Haven & Hartford Railroad with officers of the Connecticut Manufacturers' Association and of various local manufacturers' associations in that State was held at New Haven, Monday, Jan. 17. It was agreed that the railroad should submit to each of the organizations a list of cars not unloaded in each city so that their unloading could be followed up by the local secretaries. The organizations agreed to urge upon consignees the now more urgent necessity for prompt unloading. But unloading is the smaller part of the trouble.

At Waterbury, Conn., where the situation has been particularly serious, the trouble in only a minority of cases is due to the failure to unload. Much more serious, manufacturers assert, is the failure to deliver cars. No plant in Waterbury has yet been compelled to cut down production greatly, but with many, operation is a matter of planning from day to day. The brass working companies are all drawing on their reserves of spelter and copper and all are uncertain as to the future. At Hartford, Conn., the railroad is swamped by the great volume of traffic coming to it for trans-shipment. One important metal-working company there was compelled to close down for a half day on Jan. 14 for lack of fuel oil. In some cases materials have been carried from New York to Hartford and other points in trucks and product returned in the same way. The business of express companies has increased greatly. In the smaller Connecticut towns a number of plants have been shut down from time to time. At Providence, R. I., the trouble is less aggravated in view of the facilities for water transportation. Extra Baltimore steamers have been put on and consignees have exerted themselves to remove freight promptly from the docks. At Worcester, Mass., some plants are short of coal, and several report that spelter shipments are from five to six weeks overdue. Most manufacturers there have considerable stocks of steel raw material. In every city the traffic departments of the various manufacturing companies have been working day and night to get shipments through or around blockades and thus far with sufficient success to keep plants from closing down. Traffic men from Pittsburgh steel companies have been in New York in the past week working to get their shipments into New England. The snowstorms of December are blamed for the original tie-up and a shortage of facilities and men are held accountable for its continuance.

On Dec. 1 the New Haven Railroad had 200 idle locomotives. The tide of traffic then rose so rapidly that twenty-four roads were telegraphed to for engines. The number received was twenty-four from five roads. On Dec. 27 there were 10,800 cars on the New Haven lines. With the embargo in force, there were 10,530 cars on these lines on Jan. 17. It is reported that 500 cars are within 100 miles of Hartford awaiting entrance, and this condition is typical of the districts of Connecticut west of the Connecticut River.

The foundries at Belleville, Ill., have united in an announcement of an advance in the wages of unskilled labor of $7\frac{1}{2}$ per cent, effective Jan. 17. The old scale was 20c. per hour and the new rate will be $21\frac{1}{2}$ c.

Steel Rail Imports Very Large—Recent Exports Make a Record

Steel rail imports into the United States are at present the largest on record. For 1915, according to Government statistics so far as tabulated, they were as follows, with comparisons:

	Gross Tons
Ten months ended Oct. 31, 1915	73,340
Ten months ended Oct. 31, 1914	19,981
Ten months ended Oct. 31, 1913	2,738

The import rate of nearly 7500 tons per month in 1915 thus compares with less than 2000 tons per month in 1914 and only 275 tons per month in 1913. The activity of the Algoma mill at Sault Ste. Marie, Ont., accounts for the high figures of last year.

Exports of rails are continually increasing though they are less than in 1913. The following table, compiled from Government data, shows recent exports and those of previous years:

	Gross Tons
August, 1915	57,040
September, 1915	41,060
October, 1915	67,782
Ten months ended Oct. 31, 1915	292,377
Ten months ended Oct. 31, 1914	161,830
Ten months ended Oct. 31, 1913	413,124
Fiscal year ended June 30, 1914	338,611
Fiscal year ended June 30, 1913	452,545
Fiscal year ended June 30, 1912	417,547
Fiscal year ended June 30, 1910	369,578

The average export rate for August, September and October, 1915, was at the high figure of 55,294 tons per month, which compares with 37,712 tons per month in the fiscal year, 1913, the largest recorded year of exports, and with 28,217 tons per month in the fiscal year of 1914—the lowest since 1910.

The distribution of the 1915 exports and those for the 10 months to Nov. 1, 1915, as compared with those for 10 months in 1913, is given in the following table:

To	To Nov. 1, 1915,	To Nov. 1, 1913
	Gross Tons	Gross Tons
Canada	6,514	149,226
Central American States and British Honduras	4,243	11,172
Other West Indies and Bermuda	29,562	27,406
Mexico	2,375	13,963
Argentina	8,374	30,072
Brazil	2,254	35,556
Other South America	20,692	23,934
Japan	3,050	19,001
Other Asia and Oceania	117,838	86,633
Other countries	97,475	12,019

Taking the 1913 data as normal, the present falling off in demand from Canada, Central America and Mexico, and especially Argentina, Brazil and Japan is striking, while the increase in rails to the West Indies, Asia and Oceania and other countries is significant of the new channels of American export trade.

British exports of rails declined from 419,730 gross tons to Nov. 1, 1913, to 219,592 tons to Nov. 1, 1915, or from a rate of nearly 42,000 tons per month in the 10 months of 1913 to about 22,000 per month in the 10 months of 1915.

Youngstown Strike Ended

The strike at the plants of the Republic Iron & Steel Company and the Youngstown Sheet & Tube Company at Youngstown, Ohio, is ended. The men, about the middle of last week, agreed to return to work on the original terms offered by the two companies, namely, that they would grant the same advances in wages as announced by the United States Steel Corporation. This will put blast-furnace and steel-works common labor on the basis of 22c. per hr. The grand jury was in session all of last week in Youngstown, hearing evidence on the riots that took place, and as a result 26 men, all of foreign birth, were indicted for participating in the riot at East Youngstown, Jan. 7, and were held for trial. It is stated that all the blast furnaces, Bessemer and open-hearth steel works and finishing mills of both companies are now in full operation.

The La Follette Iron Company's blast furnace at La Follette, Tenn., was blown in Jan. 12.

Machinery Markets and News of the Works

DEMAND EXPANDING FAST

East and West, Plants Are Extending

Less Is Heard of War Orders and Exports— Shipyard Requirements Are Heavy—Hamilton Labor Troubles Are Settled

The war business with its consequent orders of abnormal size is rapidly being supplanted by a healthy widespread demand from manufacturers who find it necessary to increase their production. Practically every market presents items indicating a splendid volume of business for the makers of machinery. The shipyards alone, filled as they are with work for the next few years, require more equipment than they have ever bought heretofore. Europe is buying at a quieter rate, but consistently. The railroads are doing little.

The Midvale Steel & Ordnance Company is inquiring for about forty machines. The Bullard Machine Tool Company has placed orders for a good-sized list of tools. The Zeh & Hahnemann Company, maker of automatic sheet metal machinery, has placed a contract for the extension of its press department. J. H. Williams & Co., makers of drop forgings, have placed a contract for additions to their Buffalo plant. The New York Air Brake Company has completed plans for an addition to its plant at Oswego, N. Y. The Morrow Mfg. Company, Elmira, N. Y., has broken ground for a building to house its automatic screw-machine department. Henry Disston & Sons, Tacony, Pa., have awarded the contract for a file shop to cost about \$52,000. It is reported that the Newport News Shipbuilding & Dry Dock Company will expend about \$400,000 in its various departments.

Distributors of tools in Chicago continue to receive a steady stream of inquiry, and lately have been called upon for small lathes to be shipped to other territories, indicating that localization of markets is disappearing to some extent. Plant extension in the West is going on at a remarkable rate. The General Fire Extinguisher Company, the American Ever-Ready Company and the Central Bag Mfg. Company are among those who will erect mill buildings in the Central Manufacturing District, Chicago. The Stearns-Rogers Foundry Company, Pueblo, Col., is building an addition to its machine shop at a cost of about \$75,000.

Cleveland notes a liberal offering of second-hand machines from the South and West. The market is active, but no large inquiries are pending. The scarcity of labor in the Middle West has prevented some plants from putting on night forces. The Chisholm & Moore Mfg. Company, Cleveland, has purchased machinery for doubling its output of chain hoists. The East Iron & Machine Company, reported to have large war orders, has contracted for a second factory addition.

The Harrow Steel Spring Company, Kalamazoo, Mich., has improvements under way, including hydraulic press equipment, which will cost about \$60,000. The Hoover Steel Ball Company, Ann Arbor, Mich.,

has let a contract for additions to its forge, tempering and grinding departments.

The labor troubles which have harassed Hamilton, Ohio, are practically over, the majority of the plants having established a nine-hour day for five days a week, and five hours on Saturdays. All over this time is to be paid for at the rate of time and a half.

The American Car & Foundry Company will erect a woodworking plant at Binghamton, Tenn. It will be equipped with motor-driven machinery and cost in all about \$25,000. The tool business in St. Louis is active. The Busch-Sulzer Bros.-Diesel Engine Company plans an addition to its plant at a cost of \$40,000.

In the Pacific Northwest the shipbuilding industry is expanding at a remarkable rate. Shipments of machinery to Vladivostok continue heavy.

The Texas report mentions that the Southern Pacific Company will this year spend \$217,000 for a new shop building, and \$141,000 for tools and machinery.

New York

NEW YORK, Jan. 19, 1916.

The situation shows but little or no change. The industrial demand continues steady and of good volume, while the munitions makers enter the market occasionally for a few machines. At least one big order from a New England maker of small arms is pending. The Midvale Steel & Ordnance Company has issued a list for about forty machines. The Baldwin Locomotive Works has been in the market recently, taking a large number of lathes. A firm in this city has received an order of good size from the Bullard Machine Tool Company, Bridgeport, Conn., which is enlarging its plant. The shipyards are good buyers despite the long deliveries.

Railroad inquiries are not numerous, and are mostly confined to one or two tools which are urgently needed. In some instances, when master mechanics have learned of the time they must wait for a desired machine they have turned their attention to doing the work some other way. The momentum of last year will carry tool builders along for some time, and some would welcome a chance to do some catching up on deliveries. Meanwhile the amount of inquiry in the air indicates that a great deal of buying is yet to be closed.

Europe is buying consistently, although the export demand is not as heavy as it was a few months ago. The inquiry is confined to the established makes of tools. Some large inquiries have come from Russia, but business is hampered by the lack of available machines. France is buying at a good pace, and Italy likewise.

The Fox Film Corporation, 126 West Forty-sixth Street, New York, has had plans drawn by Thomas W. Lamb, 644 Eighth Avenue, New York, for the construction of a motion picture plant to cost over \$1,000,000. It will be erected at Corona, Long Island, on a site of 16 acres, and will include a factory for manufacturing motion picture products.

The Zeh & Hahnemann Company, manufacturer of presses, automatic sheet-metal machinery, etc., Avenue A and Vanderpool Street, Newark, N. J., has let contract for the erection of a one-story brick addition, 42 x 50 ft., to provide more space for the manufacture of its presses. E. W. Zeh is secretary.

The Stewart Hartshorn Company, manufacturer of spring shade rollers, East Newark, N. J., plans to erect a new plant at Millburn, N. J., but is not prepared at this time to give out any detailed information.

The Geneva Cutlery Company, manufacturer of razors, shears, etc., Geneva, N. Y., has let contract for an addition providing about 30,000 sq. ft. of floor space, to be completed April 1. L. H. Henry is manager.

J. H. Williams & Co., Brooklyn, N. Y., makers of drop forgings, have placed with the John W. Ferguson Company, Paterson, N. J., a contract for several additions to their

Buffalo plant. The drop hammer shop addition will be the largest, consisting of four bays, 64 x 310 ft., of structural steel and brick. The stock and finishing building will be enlarged by five bays, each 80 x 82 ft., of similar construction. A new one-story repair shop, 62 x 98 ft., with a mezzanine floor and craneway in the center, will also be erected.

The Percival Smith Company, Poughkeepsie, N. Y., has let contracts for the erection of three two-story buildings for the manufacture of automobile accessories, to cost, approximately, \$100,000. Grant Smith is president.

The New York Air Brake Company, 165 Broadway, New York, has completed plans for a one-story addition to its plant at Oswego, N. Y., to cost \$50,000.

The Schules Grape Juice Company, Highland, N. Y., is having plans prepared for a factory, to cost \$15,000, to replace one recently destroyed by fire.

The William B. Burke Iron & Steel Company, Rochester, has let contract for the erection of a warehouse and stock-handling plant on Mortimer Street, 140 x 200 ft., one story, of brick and steel.

The Dynetto Electric Company, Syracuse, N. Y., is taking bids for an addition to its factory at Wolf and Park streets.

The Justin Seubert Company, Syracuse, N. Y., is having plans prepared for an addition to its factory on South Clinton Street.

Pass & Seymour, Inc., Solvay, N. Y., are taking bids for a factory addition.

Philadelphia

PHILADELPHIA, PA., Jan. 17, 1916.

Henry Disston & Sons, Inc., Tacony, Philadelphia, has awarded contract to F. W. Van Loon, Denckla Building, Philadelphia, for the construction of file shops at Wissahomming Avenue, Tacony, to cost about \$52,000.

The Penn Foundry & Mfg. Company, manufacturer of gray iron castings, ore-roasting furnaces, etc., Reading, Pa., has been incorporated by Edgar P. Fidler, James L. Mark, and George W. Bland with a capital stock of \$15,000. It has taken over the former Wyomissing foundry at Wyomissing, Pa., and has already begun operations. It is in the market for a second-hand jib crane or traveling crane suitable for loading cars, and for a second-hand mono-rail hand hoist. Edward K. Mark is manager.

The Donaghmore Iron & Steel Company, Lebanon, Pa., is stated to have let a contract for a shear shed, 100 x 200 ft.

The plant of the Stahler Machine Co., Allenport, near Mount Union, Pa., has been leased to the H. L. Dixon Company, Pittsburgh, which has taken charge of the plant and will turn out a general line of foundry work.

The Peck Machine & Ordnance Co., Philadelphia, with a capital stock of \$5,000, has been incorporated by J. C. Bartlet, 2010 Spring Garden Street; Frank J. Little, 5631 Chester Avenue; Frederick G. Peck, Thirty-fourth and Spring Garden Street, and James B. Wilson, 2001 Arch Street, Philadelphia, to manufacture machines, shrapnel, etc.

The Wenzell Specialty Company, Philadelphia, with a capital stock of \$10,000, has been incorporated by Samuel S. Wenzell, 215 South Fourteenth Street, Philadelphia; Benjamin C. Linefoot, 910 South Forty-eighth Street, Philadelphia, and Joseph C. Hainer, 416 Atlantic Avenue, Ocean City, N. J., to manufacture automobiles, automobile supplies and appliances.

The P. M. Walton Mfg. Company, Philadelphia, with a capital stock of \$31,000, has been incorporated by Wray C. Arnold, 121 North Twentieth Street, Philadelphia; James J. Tighe, 1224 Spruce Street, Philadelphia, and D. H. Wolfenden, 4651 Sheldin Street, Philadelphia, to establish a general foundry and machine shop.

The Lansdowne Machine Company, Lansdowne, Pa., with a capital stock of \$25,000, has been incorporated by Clement R. H. Cunningham, Harry Bloodsworth and Howell Cunningham, Lansdowne, Pa.; Miner Harvey, 4217 Haverford Avenue, and Elmer W. Nittinger, 2462 North Nineteenth Street, Philadelphia, to manufacture machine parts, automobiles, engines, etc.

The Roller Tray Incubator Company, Northampton, Pa., with a capital stock of \$50,000, has been incorporated by Wilson Aborgast, Allentown, Pa., and others, to manufacture incubators and brooders.

The Huskey Mfg. Company, Philadelphia, with a capital stock of \$25,000, has been incorporated by Harry Huskey, 1642 North Sixth Street, Philadelphia; Abraham Huskey, 1605 North Sixth Street, Philadelphia, and Joseph P. Murray, 1428 Land Title Building, Philadelphia, to manufacture cabinet work and supplies.

New England

BOSTON, MASS., Jan. 17, 1916.

The embargoes placed on freight movements by the New England railroads are causing much concern to manufacturers. The shortage of coal, steel and other raw materials has caused a few factories to shut down and many are drawing upon their reserves to keep going. The railroads are using every means to make conditions better and report a gain, but are unable to name the time when the embargoes can be lifted. In conjunction with this trouble is the increasing shortage of help. If conditions do not quickly improve it is predicted by many that there will be a sudden cessation of the prosperity now enjoyed by nearly all New England industries.

The Westfield Mfg. Company, Westfield, Mass., has reached an agreement with its employees whereby they will receive a 10 per cent increase in pay with time and a half for overtime and double time for Sundays and holidays.

The United Smelting & Aluminum Company, New Haven, Conn., will build a factory on Commerce Street, containing 50,000 sq. ft. The working force will be increased 100 hands.

The Union Twist Drill Company, Athol, Mass., has given its employees a bonus of two per cent of each employee's pay for the year 1915.

The Rose Washing Machine Works, Dayton, Ohio, is negotiating with a committee of the Easthampton, Mass., board of trade to remove the business to Easthampton to the building formerly occupied by the Brown Wagon Mfg. Company.

The Chase Metal Works, Waterbury, Conn., will build a one-story addition, 160 x 180 ft., with wing 20 x 160 ft., on Thomaston Avenue.

The American Brass Company, Waterbury, Conn., will build a one-story addition to its plant on South Main Street.

The Fess Rotary Oil Burner & Liquid Fuel Company, Boston, Mass., has been incorporated with authorized capital of \$250,000. R. M. Nichols is president. The Athol, Mass., Merchants Association is trying to secure the industry.

The Wyman & Gordon Company, Worcester, Mass., maker of drop forgings, has awarded a contract for three additions.

Lockwood, Greene & Co., engineers and mill architects, has been incorporated under Maine laws with an authorized capital of \$300,000. The company's main offices are in Boston, Mass.

James M. Smith Company, Seymour, Conn., has been incorporated with authorized capital of \$30,000 to manufacture machinery.

The Connecticut Alloyed Metals Company, capitalized at \$500,000, has purchased the factory at Bridgeport, Conn., formerly occupied by the United Foundry & Machine Company. An additional factory will be erected. W. R. Pearson, New York City, is president, and James G. McKay, Stamford, Conn., is vice-president and general manager.

The Remington Arms-Union Metallic Cartridge Company, Bridgeport, Conn., has been incorporated with capital of \$60,000,000 to acquire the stock and carry on the business of the Remington Arms & Ammunition Company and the Union Metallic Cartridge Company, both of Bridgeport. The capital stock is divided into 1,200,000 shares of the par value of \$50 each, \$20,000,000 of which is preferred and \$40,000,000 common stock. This is the largest corporation ever organized under the laws of Connecticut.

The Norton Company, Worcester, Mass., will build a six-story building, 64 x 80 ft., for storage of supplies and a two-story machine repair and carpenter shop, 30 x 208 ft. The latter building will have the second floor in the form of a balcony, providing a craneway in the center to serve the machine shop.

The United Smelting & Aluminum Company, manufacturer of aluminum ingot and alloys, New Haven, Conn., has been incorporated with a capital stock of \$175,000. It has absorbed the company of Abe Lapides, by which it was formerly controlled. Harris Lapides is president and Michael Lapides, vice-president, will have charge of the laboratories and technical department. Louis Lapides is secretary and general manager, and Abe Lapides is treasurer. L. M. Brile, for a number of years connected with the United States Reduction Company of Chicago, will be sales manager. It has erected a plant at New Haven, which has proved too small for its needs; and it has, therefore, purchased a site adjoining, 80 x 114 ft., where it will construct a building to contain four or five special reverberatory furnaces and also a white-metal department.

The Nelson Blower & Furnace Company, manufacturer of pressure blowers, gas blast furnaces, etc., now located at 211 Atlantic Avenue, Boston, Mass., will place its new plant at 11 Elkins Street, South Boston, Mass., in full operation shortly. A. H. Nelson is manager.

Baltimore

BALTIMORE, Md., Jan. 17, 1916.

The Consolidated Engineering Company, Calvert Building, Baltimore, plans to operate a machine shop at Whitmore and Westwood avenues.

Extensive improvements are planned at the plant of the Newport News Shipbuilding & Drydock Company, Newport News, Va. It is stated about \$400,000 will be expended in various departments.

Additional machinery will be installed by the Norton Coal Company, Norton, Va.

With \$10,000 capital stock, the Williams Roofing & Plumbing Company, Petersburg, Va., has been incorporated. B. C. Syme is secretary and treasurer.

Wood-working machinery is to be installed by the Petersburg Cabinet Company, Petersburg, Va., which has been incorporated with a capital stock of \$10,000. J. H. Allen is president and treasurer. It will build a general line of exterior and interior trimmings, fixtures, etc.

A permit has been granted H. T. Wallace of the Delaware Steel & Ordnance Company, Wilmington, Del., owner of the old Diamond State Steel plant, to make alterations costing about \$10,000 to the plant.

The Commercial Paper Box & Envelope Company, Front Street, Chester, Pa., is erecting a building, 90 x 257 ft., in which machinery will be installed.

The Richlands Brick Corporation, Richlands, Va., will purchase a 100-hp. boiler with a high-speed engine. Used equipment will be considered.

Chicago

CHICAGO, ILL., Jan. 17, 1916.

A steady stream of inquiry continues to demand the greatest activity on the part of distributors of machine tools in the endeavor to meet such requirements as can be provided for. The past week has seen an especially insistent call for 18-in. and 20-in. lathes, milling machines, and drill and reamer grinders of all descriptions. A few days ago there appeared to be a special demand for smaller lathes. In this inquiry all localization of markets seems to have disappeared and the Easterner buys in the West or in any other market where the required tools may be found. The fear of serious difficulty as the result of railroad congestion is being dissipated with the failure of any serious delays to develop. Plant extension in the West, particularly of machine shops and foundries, is being undertaken at a remarkable rate and anticipation of a heavy demand from local manufacturers for equipment of new plants throughout the spring becomes each week more assured. The railroads are still doing comparatively little; but it is reported that they, together with a number of manufacturers, are now making up budgets which include liberal allowances for new machine-tool equipment.

Manning, Maxwell & Moore, Inc., has leased for its Chicago quarters a three-story building to be erected at 27 North Jefferson Street. It is now located at 111 North Canal Street.

Davidson & Weiss, architects, 53 West Jackson Boulevard, Chicago, advise concerning the foundry to be erected under their direction at Clearing, Ill., mention of which was made last week, that contracts have been awarded.

The Wilson & Bennett Mfg. Company, Sixty-fifth Place and Fifty-eighth Avenue, Chicago, manufacturer of steel barrels and oil and gasolene tanks, is in the market for steel barrel machinery.

S. Scott Joy, district architect for the Central Mfg. District, Chicago, Ill., 1118 West Thirty-fifth Street, advises that the standard mill buildings for which contracts have recently been closed include one for the General Fire Extinguisher Company, containing 37,000 sq. ft., to cost \$50,000; one for the American Ever-Ready Company, with 90,000 sq. ft., to cost \$130,000 and one for the Central Bag Mfg. Company, with 80,000 sq. ft., to cost \$100,000.

The Amalgamated Machinery Corporation, 72 West Adams Street, Chicago, advises that its new shop at Racine and Thirty-seventh streets in that city was completed in December, and the company now has capacity for the manufacture of twenty machines daily.

A. M. Castle & Co., jobbers of iron and steel, Chicago, have completed an addition to their warehouse, 60 x 250 ft., of steel construction, equipped with traveling cranes, etc.

The Gibbs Machine Company, Chicago, has been organized with a capital of \$5,000 by Thomas Gibbs, W. A. Hamilton, 38 South Dearborn Street, and E. C. Murphy.

The John E. Angell Steam Specialties Company, Chicago, has been incorporated with a capital stock of \$50,000 by Andrew J. Ryan, Thomas J. Condon and Irvin J. Livingston, 38 South Dearborn Street.

The Kofaro Steel Company, Chicago, has been organized by Peter Kohlss, Albert J. Rousseau and William H. Fahrney. It can be reached at 38 South Dearborn Street.

Milton J. Foreman will receive bids until Jan. 24 at the offices of State Architect James B. Dibelka, 130 North Fifth Avenue, Chicago, for boiler plant, electric elevators and hay, grain and ash elevators for the First Calvary Armory at Chicago.

The New York Central Railroad is in the market for a combination punch and shear, 48-in. stroke, to punch 1 1/4-in. plates and shear bars 1 1/8 x 6 in., for its Englewood shops at Chicago.

F. E. Colby, architect, Sioux City, Iowa, has prepared plans for a foundry to be erected at 214 Sixth Street, at an approximate cost of \$40,000 for the Denkman & Herms Company.

The Martin Metal Company, Wichita, Kan., will build an addition to its factory, 100 x 140 ft.

The Paxton Mitchell Company, Omaha, Neb., is planning the erection of a new factory.

Ground is to be broken very shortly for the new plant of the Omaha Ice & Cold Storage Company, Omaha, Neb., to cost about \$85,000.

The Stearns-Rogers Foundry Company, Pueblo, Col., is building an addition to its machine shop, 90 x 220 ft., of pressed brick and stone, to cost complete about \$75,000.

The Borreson Mfg. Company, St. Paul, Minn., maker of automobile tags, is considering the erection of a new plant, to cost about \$25,000.

The Mark G. Meek Corporation, St. Paul, Minn., has been organized with a capital stock of \$300,000, to manufacture stump-pulling and logging machinery. The incorporators are Abraham Wiley and Fred H. Wendell, Minneapolis, and Mark G. Meek, Duluth.

Cleveland

CLEVELAND, OHIO, Jan. 17, 1916.

An interesting feature of the machine-tool market is the liberal offering of second-hand machinery from the South and West. Second-hand machines became so scarce in the Central West some time ago that dealers were as glad to pick up one machine as they are to secure a round lot in normal times. Southern and Western dealers have come to a realization of the high prices prevailing and are placing any tools that can be spared on the market. The offerings of Western machinery are largely from the Pacific coast. These are eagerly picked up, although the cost, when freight charges are included, is very high.

The market is active. While no large inquiries are pending a good demand is coming from scattered sources for small lots. Some users are deferring purchases because of prevailing high prices.

Surface grinders are in unusually good demand and hard to get because of the large amount of die work. Cranes for industrial plants are selling well.

A greater scarcity of labor exists in Cleveland metal-working shops than at any time within the past few months. Many plants would employ additional mechanics if men could be secured and this scarcity has prevented some from putting on a night force.

The Chisholm & Moore Mfg. Company, Cleveland, will build an addition to its chain hoist department, about doubling the capacity. It has, during the past few days, bought about \$40,000 worth of machinery for the extension.

The Cleveland Motorcycle Company has been formed to manufacture motorcycles and is in the market for machinery. Temporary offices are in the plant of the Adams-Bagnall Electric Company, Cleveland.

The National Telephone Supply Company, Cleveland, will erect a plant at Superior Avenue near East Forty-ninth Street. Plans have been prepared by Richardson & Yost, architects, Rockefeller Building, Cleveland.

The plant of the Ohio Standard Chemical Company, Silica, Ohio, has been sold to the J. L. & H. Stadler Company, Cleveland. It will be used to manufacture fertilizers.

The Ohio Forge Company, Cleveland, Ohio, has increased its capital stock from \$100,000 to \$800,000.

The Willard Storage Battery Company, Cleveland, will erect several additional brick, steel and reinforced concrete buildings the coming spring. The Gaylord W. Feager Company, Cleveland, is the architect and contractor.

The East Iron & Machine Company, Lima, Ohio, which is reported to have taken some large foreign orders, has placed a contract for another addition. This is the second enlargement within a few months.

The chamber of commerce, Ravenna, Ohio, has about closed negotiations with Cleveland interests to establish a plant in the four-story factory of the National Lamp Company for the manufacture of rubber specialties, etc.

The Hascall Motor Truck Company, Painesville, Ohio, has been incorporated with a capital stock of \$100,000 by I. Amster, E. M. Damner, John P. Dempsey, and others.

The Weber Dental Company, Canton, Ohio, has erected two shop buildings, one for a foundry and the other for an enameling department. It is planning to build two additional buildings in the spring, one for a polishing and plating department and the other for warehouse purposes.

The Physicians & Dentists' Corporation has completed negotiations with the chamber of commerce, Canton, Ohio, for the removal of its plants to Canton from Cleveland, and Massillon, Ohio, and New Castle, Pa. It will occupy a two-story brick building and will include X-ray and other electrical apparatus in its products.

The Owens Bottle Machine Company, Toledo, Ohio, has taken an option on the plants of the American Bottle Company of Ohio, which has plants in Newark, Ohio, and Streator, Ill.

Gartland Brothers, Toledo, Ohio, have completed their new No. 1 foundry which is being placed in operation. It occupies a building 100 x 300 ft.

The Kuhlman Engineering Company, Toledo, Ohio, has been incorporated with a capital stock of \$10,000 by Carl Kuhlman, L. J. Harsh, George W. Fluckey, and others, to engage in general engineering and manufacturing.

The Western Reserve Steel Company, Warren, Ohio, has placed an order for a 15-ton Shaw electric crane.

The B. F. Goodrich Company, Akron, Ohio, will erect a six-story garage, 169 x 315 ft., the first two floors to be used for garage purposes and the remainder for a repair shop and service station.

J. Harrold will erect a plant, 50 x 150 ft., in Columbiana, Ohio, for the manufacture of mechanics' tools and automobile accessories.

The Thornburgh Mfg. Company, Bowling Green, Ohio, plans to build an extension that will double the capacity of its present building. Its products include bob sleds, lawn swings and farm machinery.

Indianapolis

INDIANAPOLIS, IND., Jan 17, 1916.

The South Bend Foundry Company, Lafayette Street and Indiana Avenue, South Bend, Ind., is building an addition to its coreroom, 40 x 100 ft. C. C. Lee, formerly with the Studebaker Corporation, has been appointed superintendent.

The Interstate Automobile Company, Muncie, Ind., has increased its manufacturing facilities, with an additional factory and will turn out about thirty cars a day.

Swayne, Robinson & Co., Richmond, Ind., will build a foundry, 35 x 127 ft., north of its present building. It is to be of concrete, steel and brick and will cost approximately \$10,000.

The Sterling Metal Mfg. Company, Huntington, Ind., has been incorporated with a capital of \$25,000, and will erect a plant at that place. It can be reached in care of Orlando Rex, 8 South Dearborn Street, Chicago.

Frank Betz & Co. will build a factory, 75 x 164 ft., at Hammond, Ind., to cost \$17,000.

The Pierce Speed Controller Company, Anderson, Ind., has changed its name to the Pierce Governor Company.

The Wrightmann Mfg. Company, South Bend, Ind., has been incorporated with \$10,000 capital stock to manufacture household and office novelties. The directors are Clinton C. Tiedemann, John B. Wright and Louis M. Hammerschmidt.

The Oakes Company, Indianapolis, manufacturer of automobile parts, has increased its capital stock from \$75,000 to \$175,000.

The Co-Operative Auto League, Indianapolis, has been incorporated with \$10,000 capital stock, to manufacture automobile accessories. The directors are Horace N. McKee, Fay L. Murray and John Provines.

The American Air Craft Company, Indianapolis, has been incorporated with \$50,000 capital stock, to manufacture aeroplanes and other machines. The directors are R. B. Allison, D. J. Foster and John Keefe.

Milwaukee

MILWAUKEE, WIS., Jan. 17, 1916.

The metal-working trades are rapidly reaching an average of 100 per cent capacity. While a number are operating as high as 175 per cent, others have been down to 50 and 60 per cent. No slackening is noted in any line, except for the usual period immediately following the new year. Reports from all parts indicate a general extension of work, notably among builders of special-purpose machinery, while manufacturers of gasoline engines, tractors, agricultural implements, automobiles and vehicles are finding present capacity somewhat crowded and demanding enlargement. The expected slackening of machine-tool demand for exportation seems to be coming to pass, giving domestic buyers an opportunity to fill their requirements somewhat sooner than hoped for.

The Algoma Motor Car Company, Algoma, Wis., owned by Berl F. Ryder, has purchased a site at Fourth and Fremont streets and will build a garage and machine shop, 60 x 107 ft., two stories.

J. P. Erickson and Victor Carlson, Ogema, Wis., will build a woodworking shop, 32 x 80 ft., two stories, with a small steam power plant.

The board of water commissioners, Kenosha, Wis., is advertising for sealed bids for the construction of a water-works pumping station and water purification works, estimated to cost \$200,000. Bids close Jan. 29.

The C. Reiss Coal Company, Sheboygan, Wis., is preparing to rebuild and enlarge its coal dock No. 3, at Superior, Wis., and has awarded the contract for a new 7-ton bucket bridge to the Heyl-Patterson Company, Pittsburgh, Pa., for approximately \$150,000. The dock will be extended 300 ft., making it 2000 ft. long. The entire work will cost in excess of \$300,000.

The Winter Mfg. & Equipment Company has been organized at Sheboygan, Wis., by E. A. Winter, R. H. Pfeifer and Arthur F. Winter, Jr., to manufacture steel and frame filing cabinets, wardrobes, lockers, safety cases and mechanical and electrical factory and office appliances.

It is likely that the plant of the Globe Iron Works, Menomonie, Wis., which has been idle for several years, will pass into new control and resume operations. Several outside manufacturers are negotiating for the plant, which was used for gasoline engine manufacture.

The Mendenhall Company, Watertown, Wis., is about to take occupancy of its new machine shop at 207 Second Street. An addition, 25 x 44 ft., is now under way. Commencement of operations was seriously delayed by the inability to get prompt delivery on lathes and other tools, but these are now coming forward.

The management of the Bay Iron Works, Bayfield, Wis., has passed into the hands of Theodore Bruette, who is planning enlargements to meet the demands upon the shop.

The Milwaukee Brush Mfg. Company, Milwaukee, has been incorporated with a capital stock of \$50,000 by Edward W. Hoffmann, Elton F. Streich and Charles B. Quarles, attorney, to manufacture wire brushes, brooms, etc., and has leased the vacant shops at 51-61 Erie Street, Milwaukee. Operations will begin Feb. 15 or March 1.

The American Metal Products Company, 3009 Lisbon Avenue, Milwaukee, is planning to increase its floor space and increase its equipment. The foundry is working to full capacity.

Detroit

DETROIT, MICH., Jan. 17, 1916.

The Kramer Governor Company, Detroit, manufacturer of regulating devices, is increasing its capacity by the erection of a two-story brick addition. Some new equipment will be installed.

The National Twist Drill Company, Detroit, is planning the construction of a four-story addition.

The Welt Engineering Company, Detroit, has been incorporated with \$400,000 capital stock to do a general machine shop and engineering business. The incorporators are J. H. and F. H. Walker and John W. Anderson.

The Globe Furniture Company, Northville, Mich., will add a department for the manufacture of light automobile trucks.

The Gale Mfg. Company, Albion, Mich., manufacturer of agricultural implements, is planning the expenditure of \$40,000 for new buildings and additional equipment.

The machine shop of the Michigan Bag & Paper Company, Jackson, Mich., was destroyed by fire Jan. 6. The loss is estimated at about \$10,000.

A. T. Ferrell & Co., Inc., Saginaw, Mich., has been incorporated with \$500,000 capital stock to manufacture seed-cleaning and canning machinery. It is a going company and the incorporation is to enable it to handle increasing business to better advantage. A. T. Ferrell is president.

The Fibre Package Company, Detroit, manufacturer of composition containers, has acquired a site of two acres on which it will erect a plant. Charles G. Gray is general manager.

The G. T. Eames Company, Kalamazoo, Mich., has been incorporated with a capital of \$10,000. It will manufacture a mandrel press and drill grinder, and other devices.

The Harrow Steel Spring Company, Kalamazoo, Mich., advises that improvements under way at its plant at a cost of \$60,000 will include hydraulic press equipment to be installed in connection with its bar mills. W. W. Gregg is works manager.

The Gier & Dall Mfg. Company, Lansing, Mich., has increased its capital stock from \$300,000 to \$500,000. It will manufacture automobile bodies and increase its output of other sheet metal stampings. W. K. Prudden is president.

The Hoover Steel Ball Company, Ann Arbor, Mich., has let contract for additions to its forge and tempering department and to its grinding department, and will also build an office building, all of concrete and brick. This makes a total of six buildings which have been added in about 18 months, giving it about 60,000 sq. ft. of floor space. L. J. Hoover is vice-president and general manager.

Cincinnati

CINCINNATI, OHIO, Jan. 17, 1916.

The striking machinists in nearly all of the shops in Hamilton, Ohio, returned to work to-day. Individual settlements were made and no recognition of the machinists' union, in any form, was made. As the matter stands it is simply an agreement between employer and employee. The majority of the plants have established a 9-hr. day for five days in a week, and five hours on Saturdays. All over this time is paid at the rate of time and a half. A few of the foundries in Hamilton are still having trouble with the molders, but are operating with reduced forces.

Local machine-tool builders, as a rule, report the demand for machine tools as being much quieter. This applies both to domestic and foreign business. The local labor situation is fairly satisfactory. Portable electric drilling machines are still good sellers, and orders from Europe are said to be more numerous than for a long time. Sawmill machinery is being bought freely, in the South especially. The boiler and tank business is fair.

The Industrial Exposition at Dayton, Ohio, which lasts through the present week, is attracting a large number of outside visitors. The labor situation in that city is improving, although there is still trouble at two or three plants.

The revised plans for the foundry addition to the plant of the Lunkenhimer Company, Cincinnati, call for a reinforced concrete structure, 100 x 300 ft.

The John Steptoe Shaper Company, Cincinnati, has let contract for an addition to its plant on Colerain Avenue that will be 86 x 90 ft., two stories, of brick construction.

The Union Gas & Electric Company, Cincinnati, will soon commence work on its electric generating plant on Front Street.

It is unofficially confirmed that the Sanitary Mfg. Company, Hamilton, Ohio, manufacturer of plumbing pottery, will remove its plant to Huntington, W. Va., and add sufficient equipment to double its present capacity.

The Manufacturers' Production Company, Dayton, Ohio, has commenced work on its new plant in East Dayton. The Dayton Structural Concrete Company has charge of construction.

It is currently reported that the Allied Electrical Company, Chicago, Ill., has had plans prepared for erecting a plant at Xenia, Ohio, for the manufacture of electric fans.

The Springfield Metallic Casket Company, Springfield, Ohio, will soon begin installing machinery in an addition to its plant now under construction.

The Springfield Light, Heat & Power Company, Springfield, Ohio, has made arrangements for doubling the capacity of its plant. It is understood that most of the necessary equipment has been bought.

The Efficient Tool Company, Springfield, Ohio, Carl M. Stretcher president, is making preparations for manufacturing a new lathe center grinder.

The Solar Metal Products Company, Columbus, Ohio, manufacturer of steel doors and window frames, will make an extension to its factory, 100 ft. square, one story, of concrete construction.

Plans have been completed by the chamber of commerce, Columbus, Ohio, for the formation of a company to be known as the Columbus Industrial Securities Company, with a capital stock of \$250,000. Its purpose is to help finance new manufacturing companies who will locate in Columbus.

The Ford Motor Company, Columbus, Ohio, is having plans prepared for an addition to its assembling plant in Columbus, estimated to cost \$100,000. Building details are not yet available.

The United States Can Company, Norwood, Ohio, has increased its capital stock from \$250,000 to \$600,000, and will make extensive additions to its factory.

Birmingham

BIRMINGHAM, ALA., Jan. 17, 1916.

A fairly good business was done in all lines the first ten days of January, with wood-working appliances in the lead. The demand from structural operators is increasing and new factories are adding to the call for machine tools. Dealers report a thoroughly satisfactory start for the new year.

The Texas Oil Company, 17 Battery Place, New York, will rebuild fourteen oil tanks, a pump house, etc., burned at Birmingham, with a loss of \$150,000.

Hampton S. Smith and others have incorporated the East Birmingham Roofing Company, East Birmingham, with a capital stock of \$10,000, to manufacture corrugated iron roofing.

Moores & Dunford, engineers, 10 La Salle Street, Chicago, are preparing plans for terminals of 900,000 sq. ft. floor space, to be equipped with latest leading devices, etc., for the Mobile Terminal Transfer & Storage Company. The total investment will be about \$1,000,000.

The Ingalls Iron Works, Birmingham, will expend more than \$50,000 on additions to its structural steel and iron works.

Swift & Co., Chicago, will soon begin construction at Augusta, Ga., of a cotton-seed oil mill, to cost \$320,000 with equipment. O. M. Davis is general superintendent.

It is reported that the Louisville & Nashville Railroad will build a new shop at Pensacola, using electric power.

The Central South

LOUISVILLE, KY., Jan. 17, 1916.

Machinery houses report the past week fairly quiet, probably due to inventory taking. The general outlook, however, is excellent, with every reason to believe that business in the next few months will be active. The lumber, textile, coal-mining and other large industries in this locality are working at capacity, resulting in a good call for factory and mill supplies, as well as machinery.

The Falls City Elevator & Machinery Company, Louisville, has been organized with John O. Arnold president and G. J. Smith secretary and treasurer.

Paducah, Ky., is planning to purchase equipment for a machine and blacksmith shop. C. L. Van Meter is commissioner in charge.

The broom factory of John A. Graham, Lexington, Ky., was destroyed by fire recently with a loss of \$8,000. The equipment will be replaced.

The Nashville, Chattanooga & St. Louis Railway, with general offices at Nashville, Tenn., and the Chicago, Burlington & Quincy, general offices in Chicago, are planning the establishment of joint repair shops at Paducah, Ky.

The Bond Reduction Company, Bond, Ky., has been organized to manufacture clay products, and will install dry kilns and other equipment. C. E. Kennedy is president and B. A. Bounds manager.

L. L. Stone, Pikeville, Ky., is planning to erect and equip a garage, which will include a repair shop.

The American Car & Foundry Company will erect a wood-working shop, 90 x 245 ft., at Binghamton, Tenn., to be equipped with motor-driven wood-working machines. The building and equipment will cost \$25,000.

The Kelly Axe Mfg. Company, Charleston, W. V., has announced plans for a handle factory at Memphis, Tenn. A building has been purchased and will be equipped at once. The machinery will be motor-driven.

Fred S. Bolch, Newport, Tenn., will build a cold storage plant and ice factory, at a cost of \$15,000.

The Shop Engineering & Sales Company has been organized at Knoxville, Tenn., by Francis A. Jacobs, A. M. Monger, and others.

The Clinchfield Portland Cement Company, Kingsport, Tenn., will build a plant for the manufacture of hydrated lime.

Richard K. Meade, Baltimore, is engineer in charge. The building will be of steel and the equipment electrically driven.

The Diamond Hosiery Mill, Jellico, Tenn., will have a boiler plant, to supply steam for the dye-house, as well as for power.

W. B. Boaz, Hamilton, Ohio, plans to establish a plant at Chattanooga, Tenn., for the manufacture of heating equipment.

The John G. Duncan Company, Knoxville, Tenn., is in the market for a 6-ft. second-hand pony bandmill for immediate delivery.

St. Louis

ST. LOUIS, MO., Jan. 17, 1916.

The machine-tool business has been continuously active, with dealers facing a situation which is going to keep them at their wits' end satisfying customers. The pressure from industrial plants grows more acute every week, because of desire to replace or extend and dealers are in a position where, for the most part, they can promise nothing better than ten to twelve months' delivery. It has ceased to be a price proposition or even a selling problem. It is simply a question of when delivery can be made. Inquiries continue largely of single tool character, it having become evident that about the only way to get equipment is to go after it an item at a time with the hope of picking up here and there at least a substitute for the tool desired. Collections continue very good throughout the St. Louis territory. Money is easy and investment funds are increasing.

The Fred Medart Mfg. Company, St. Louis, will erect an addition to its plant for the manufacture of steel ladders. Equipment sufficient for a force of 100 employees will be installed.

The Busch-Sulzer Bros. Diesel Engine Company, St. Louis, Mo., will erect an addition to its plant at a cost of \$40,000.

The Lister Sash Weight Company, St. Louis, Mo., has been incorporated with a capital stock of \$25,000 by A. E. Poss, F. B. Hooper, L. E. McCommons, St. Louis, and D. J. McCarthy, Davenport, Iowa.

The Quick Meal Stove Company, St. Louis, Mo., will erect an addition to its plant requiring about \$10,000 of equipment.

The Bytanic Metal Company, St. Louis, Mo., has been incorporated with a capital stock of \$15,000 by W. L. Bromer, W. L. Allen and Lewis B. Tebbetts, to manufacture metal products.

The Krey Packing Company, St. Louis, Mo., has increased its capital stock from \$50,000 to \$600,000 out of its surplus and is reported as having plans for additions involving about \$250,000.

The Rice Sturtevant Motor Company, Kansas City, Mo., will erect a machine shop and garage, to cost \$16,000.

The Serlis Motor Company, Kansas City, Mo., recently incorporated with a capital of \$20,000 by Harry Serlis, Joseph Wolfe and Allen E. Reed, will erect a machine shop.

The Carr-Trombley Mfg. Company, Dubuque, Iowa, has acquired the sash and door plant of the Hafner Mfg. Company, St. Louis, Mo., and will improve and extend it.

The Becker-Moore Paint Company, St. Louis, Mo., has been absorbed by the Benjamin-Moore & Co., Inc., with plants in four cities, and considerable increase in the manufacturing equipment at St. Louis is planned.

The Liberty Foundry Company, St. Louis, Mo., will erect an addition to its plant at 314 East Stein Street, to cost about \$2,500.

The International Shoe Company, St. Louis, Mo., which has plans for a tannery to involve an investment of about \$7,000,000 ultimately, will proceed at once with the erection of the first unit. The selection of site, etc., is in the hands of Ralph D. Griffin, superintendent.

The Alton-Slater Water Company, Slater, Mo., has been incorporated with a capital stock of \$110,000 by E. J. Merkle, C. A. Lorimer and W. R. Moore, and will equip and operate a waterworks.

The Ford Motor Company, Detroit, Mich., has ordered plans prepared for a power, light and heating plant to be erected at Kansas City, Mo. C. C. Mead is local manager.

The Twin City Ice & Creamery Company, Festus, Mo., will rebuild and re-equip its burned ice plant. The capacity will be larger than the destroyed plant which had a daily output of 12½ tons.

The Kansas City Chemical Company, Kansas City, Mo., has leased 30,000 sq. ft. of floor space and will equip for the manufacture of magnesite products.

S. J. Sullivan, Hot Springs, Ark., will equip a foundry and machine shop at Argenta, Ark. He will also manufacture sash weights.

The Bartlesville Salvage Machine & Supply Company, Bartlesville, Okla., is in the market for drilling equipment and other machinery, to be utilized in manufacture of tube pullers.

The Safety Pipe Line Connection Company, Dewey, Okla., has been incorporated with a capital stock of \$10,000 by Morgan B. Fugate, L. B. Hering and Fred B. Woodward, to manufacture a special device.

The Ruemann-Braun Company, Guthrie, Okla., will build a 50-ton ice plant and a cold storage plant addition.

The Bartlett & Collins Glass Works, Sapulpa, Okla., will consolidate with the Premium Glass Mfg. Company, operating under the former name, and will double the capacity of the newly acquired plant, expending about \$30,000.

The plant of the Citizens Compress Company, Tupelo, Miss., has been burned with a loss of about \$75,000.

The Pontotoc Electric Light & Power Company, Pontotoc, Mich., will change its plant to a three-phase equipment and install one 60-kw. generator, one 50-hp. engine, one 40-kw. generator, etc.

The Slidell Dry Dock & Shipbuilding Company, Slidell, La., will install additional equipment in its plant.

Texas

AUSTIN, TEX., Jan. 17, 1916.

Official announcement is made by W. B. Scott, president of the Sunset-Central Lines of the Southern Pacific Company in Texas, that more than \$3,000,000 will be spent in improvement in 1916, including water and fuel stations, \$75,000; shop buildings, \$217,000; shop machinery and tools, \$141,000, etc.

The Midland & Northwestern Railway Company organized with offices at Midland to construct a railroad from Midland to Seminole, will build shops at Midland. T. J. O'Donnell is president.

Carl Maer is arranging to build an aeroplane factory at Fort Worth.

F. C. Cotton, Denver, Colo., has purchased the electric street railway systems of Tyler and Cleburne and will install new machinery in the power plants.

The Clinchfield Fuel Company has awarded the contract for constructing a coal-handling, transfer and storage plant at Galveston to M. C. Bowden. It will cost about \$50,000.

The city commission, Houston, plans to construct a supplemental waterworks pumping plant on North Main Street, at a cost of \$36,000.

The City Council, Casa Grande, Ariz., has taken steps toward the construction of a municipal electric light plant, waterworks plant and ice factory. The proceeds of a \$35,000 bond issue will be used.

The Pacific Northwest

SEATTLE, WASH., Jan. 11, 1916.

The new year has brought an exceptionally strong demand for several lines of machinery. The shipbuilding industry is expanding at a remarkable rate, and great improvements are being made in plants of all sizes, with a number of new companies preparing to start in the business. All types of steam and internal-combustion marine engines are in strong demand. Improvement in the lumber trade has come very rapidly, and the local machinery houses are getting a heavy run of orders for logging and mill equipment. Implement manufacturers have had a busy year, and find their business still expanding. Inquiries are beginning to appear for canary, creamery and cold-storage equipment. Mining development has been delayed somewhat by the weather. But numerous orders are coming through for machinery to be shipped in the spring.

Shipments to Russia continue heavy. Three of the Frank Waterhouse & Co. fleet recently sailed with cargoes aggregating 17,000 tons of rails, spikes, knock-down box cars and other equipment for the Trans-Siberian Railroad. Two other vessels will sail within a week for Vladivostok.

Grays Harbor lumbermen have received inquiries from the Union Pacific system for approximately 10,000,000 ft. of lumber to be used in manufacture of 1500 box cars and 500 stock cars. Other inquiries for cedar piling from railroads are on file. It is estimated that approximately 35,000,000 ft. of lumber is awaiting shipment from the Columbia River and Portland to Europe. A large portion of this has been lying on the river since last May, due to inability to obtain vessels.

J. F. Duthie, a Seattle shipbuilder, is preparing to build a drydock in that vicinity to handle ocean steamers.

The Beaver State Motor Company, Gresham, Ore., is preparing to build a new foundry. Its principal output is cross-cut sawing machines.

The Oregon-Utah Sugar Company, Salt Lake City, Utah, it is reported, will call for bids late in January for the construction of a sugar refinery in Ashland, Ore., to cost about \$50,000.

The North Bend Mill & Lumber Company, North Bend, Ore., has leased to Archie Kruse, of that city, a site for a box factory for the manufacture of lath and box shooks, 30 x 80 ft., two stories. The machinery will be electrically operated.

Preliminary plans for a flouring mill in Kingston, Mont., have been completed by L. W. Johnson, of St. Louis, Mo., Kingston representative. It will have a capacity of 2000 bbl. daily and will cost \$500,000. The power plant will develop 2000 hp. The company has been incorporated.

The American Products Company, Seattle, Wash., is reported to have completed plans for the installation of a nitrate and ammonia manufacturing plant in the Sauk River valley north of Darrington. Dr. E. Janson is president.

The Electric Heating & Mfg. Company, Seattle, Wash., has been incorporated with a capital of \$75,000, and will construct a plant for the manufacture of electric heating apparatus, etc. A plant to cost, with equipment, about \$20,000 will be acquired. J. G. Eddy, Everett, Wash., is president; R. W. Walker, Seattle, vice-president, and P. F. Apfel, Seattle, secretary and treasurer.

The Skinner & Eddy Shipbuilding Corporation, Seattle, has been formed by D. E. Skinner and C. B. Lamont, formerly connected with the Seattle Construction & Dry Dock Company. The new corporation will construct shipyards at Railroad Avenue South and Atlantic Street, where it will at once begin construction of two steel steamships, 423 ft. long, 54 ft. beam, with gross tonnage of 5356 tons. It has established temporary offices in the Lippy Building.

Canada

TORONTO, Jan. 17, 1916.

The automobile industry is exceptionally brisk. Many firms have received large foreign orders for cars of all classes. The manufacture of automobile parts is also very active. It is expected that the demand for automobiles in Canada for 1916 will exceed the supply.

The Montreal Tramways Company, Montreal, announces that its steam plant on Notre Dame Street East will be enlarged by 50,000 to 60,000 hp. Its present capacity is 10,000 hp. The first unit of 17,000 hp. will be started this season. The total expenditure will be between \$2,000,000 and \$3,000,000.

The Montreal Public Service Corporation, Montreal, is preparing plans for additions to its plant. The new equipment will be of steam power type and will have a capacity of 60,000 hp. The first unit of 15,000 hp. will be installed as soon as possible, the remainder as required.

The Well Works Company that will take over the plant of the Defiance Iron Works at Chatham, Ont., will commence shortly to install machines, so as to begin operations at an early date. W. H. Westman is an active stockholder in the undertaking.

J. S. Marshall, Oakville, Ont., is in the market for a boiler 12 ft. x 54 in. complete with grates and stack.

Davidson & Smith, Fort William, Ont., will build a 1,000,-000-bu. elevator there in the spring. Barnett & McQueen have been awarded the contract.

The Canadian Cartridge Company, Hamilton, Ont., took out a permit for the erection of another building on Sherman Avenue North, which will cost \$15,000.

The Burlington Steel Company, Hamilton, Ont., has been granted a permit and will build an addition to its factory to cost \$4,800.

Wilson Brothers, Collingwood, Ont., manufacturers of hardwood, doors, etc., will build an addition to their mill to cost \$35,000.

The Capital Iron Wire Cloth Company, Armstrong Street, Ottawa, will commence at once the erection of an addition to its plant.

The Ottawa Brass Foundry Company, Ottawa, has purchased a building on Wellington Street and will remodel it and install machinery to carry on its business there.

Work will be commenced at once on the erection of a new plant for the Weedon Chemical Company whose plant at Weedon, Que., was recently destroyed by fire.

The Reid Wrecking Company, Sarnia, Ont., will make extensive additions to its drydock at South Park to accommodate the largest boats on the Great Lakes.

Cornwall, Ont., will purchase one steam pump, two boilers, a turbine, water pump, etc. J. G. Harkness is clerk.

W. A. Mahony, Telephone Building, Guelph, Ont., will build a stove factory. Bids will be called soon for the erection of the plant.

T. Hudson, 9 Tecumseh Street, Orillia, Ont., will build a chemical plant at Lindsay, Ont., to cost \$60,000.

The Heworth Silica Pressed Brick Company, Bruce Street, Hepworth, Ont., will build a brick plant, to cost \$15,000. Work will be started shortly. C. S. Block is manager.

Construction work will be started at an early date on the erection of a roundhouse and locomotive shops at St. Thomas, Ont., for the Wabash-Grand Trunk Railroad.

The Credit River Works, Ltd., Toronto, has been incorporated with a capital stock of \$150,000 by Walter G. Hammond, Room 11, 24 King Street West; James D. McWilliams, 137 Walmer Road; Alexander McInnes, and others, to manufacture machinery, tools, etc.

The Imperial Oil Company, Ltd., Dominion Bank Building, Toronto, Ont., will build a refinery at Regina, Sask., to cost about \$1,000,000.

The ratepayers of New Toronto, Ont., passed a by-law to grant fixed assessments to the Goodyear Tire & Rubber Company of Akron, Ohio. In return the company will commence in the spring the erection of a factory to cost about \$1,000,000. Part of the plant will be ready for operation next fall.

The Canadian Northern Railway Company's pumphouse at Hanna, Alberta, was destroyed by fire.

North Vancouver, B. C., will build a new pumping station to supply the Capilano section. J. G. Farmer is clerk.

The Advance-Rumely Thresher Company, Ltd., La Forte, Sask., has been incorporated with a capital stock of \$50,000 to manufacture threshing machines, farm implements, machinery, tools, etc.

The Abso Pure Ice, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$100,000 by John R. Marshall, Stanley R. Jefferess, and others, to manufacture ice dealers' supplies, ice, etc.

The Dominion Timber & Minerals, Ltd., Montreal, has been incorporated with a capital stock of \$250,000 by Louis E. A. D. Mailhot, Louis A. David, S. H. R. Bush, and others, to build and operate sawmills, etc.

The British Munitions Company, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by Walter R. L. Shanks, Francis G. Bush, George R. Drennan, and others, to manufacture time fuses, machinery and munitions.

The William Wrigley, Jr., Company, Ltd., Carlaw Avenue, Toronto, has been incorporated with a capital stock of \$2,000,000 by William A. J. Case, Room 1201, Canadian Pacific Railroad Building; James B. Taylor, William M. Smith, and others, to manufacture show cases, jars, vending machines, chewing gum, gum chicle, etc.

The Canada Nitro Products, Ltd., Toronto, has been incorporated with a capital stock of \$5,000,000 by Charles Evans-Lewis, 6 Adelaide Street East, Toronto; Edmund H. Austin, Thomas N. Poole, and others, to manufacture machinery, explosives, guns and munitions.

Government Purchases

WASHINGTON, D. C., Jan. 17, 1916.

Bids will be received* by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 9198, for one boring machine and one 30-in. bandsaw, both for Puget Sound; schedule 9221, six oil service pumps; schedule 9222, three auxiliary feed pumps, three main boiler feed pumps, two circulating distiller pumps, two motor-driven condenser air pumps and schedule 9230, for twenty-five vertical simplex feed pumps, all for Brooklyn; schedule 9223, 1 cylindrical automatic grinder, one 3-in. vertical surface grinder, two bench lathes and one universal milling machine, all for Pensacola; schedule 9225, one outfit for pumping water, for Washington.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Jan. 4, for supplying, under schedule 9117, steam engineering, class 111, one motor-driven lathe for the Portsmouth Navy Yard—Kemp Machinery Company, \$1,316.

*No date set for receiving bids.

NEW TRADE PUBLICATIONS

Structural Steelwork.—McClintic-Marshall Company, Pittsburgh, Pa. Calendar. The leaves, which measure 15 1/4 x 21 1/2 in., have the dates for a month occupying more than half of the leaf, while above is a series of engravings, one to a leaf, showing some of the typical contracts executed. These include the Hell Gate Bridge, the Eddystone plant of the Baldwin Locomotive Works for which 9000 tons of steel was furnished and erected in 83 days, a number of office and factory buildings and railroad bridges of various types. Views of the different plants of the company are presented and on the last leaf, which contains a calendar for the entire year 1916, is given a list of the offices of the company.

Elevating Trucks.—Columbus Lift-Truck Company, Columbus, Ohio. Pamphlet. Devoted to a lift truck which was illustrated in *THE IRON AGE*, Aug. 12, 1915. There is little or no text in the pamphlet to explain the operation of the elevating mechanism, reliance being placed on a series of views showing the truck being backed under a skid, the elevating lever being moved to raise the load and the truck and load ready to be moved. The special features of the truck are its steel and iron construction and the use of a special lever which is moved from one side of the truck to the other to raise the load.

Hoists.—Wright Mfg. Company, Lisbon, Ohio. Catalog No. 7. Relates to a line of chain hoists, steel trolleys and hand cranes. A brief description of the hoists is given and the text is supplemented by illustrations of the various parts and a condensed table of specifications. Practically the same method is followed for the trolley and in the case of the hand traveling crane there is a short description of it with a single engraving showing one of the cranes equipped with the hoist and steel trolley.

Combination Tool.—Hultberg-Johanson Tool Company, Warren, Pa. Circular. Treats of a combination hand tool for machinists consisting of a handle and a set of screw driver and flat and curved scraper blades, which can be interchanged in the handle as often as may be desired. A brief description of the tool is presented, supplemented by illustrations of the various blades and the way in which they are changed.

Machinists' Tools.—Steel-Art Tool Company, Machinery Hall, Chicago, Ill. Catalog No. 6. Deals with a line of machinists' tools which includes drill and tool holders for lathes, sleeve ratchets, lathe centers, boring bars, lathe dogs, etc. All of these are illustrated and briefly described and illustrations of the different tools and tables of the sizes that can be supplied are included.

Arc Lamps and Oil Switches.—General Electric Company, Schenectady, N. Y. Two bulletins. The first, No. 43,253, describes a line of luminous arc lamps of the pendent type designed for use on direct-current circuits. Special emphasis is laid upon the features of reliability and low maintenance cost, and the description of the general construction of the lamp is supplemented by views of the different parts and a number of views of installations. The other bulletin, No. 47,409, gives a brief description of the construction and use of an industrial oil switch designed for use with induction motors of 10 hp. or less. The description is supplemented by numerous engravings of the switch and its parts, and dimension and connection diagrams are included.

Calendar.—Youngstown Sheet & Tube Company, Youngstown, Ohio. The leaves of the calendar measure 19 x 26 in. and the lower half of each is given over to the calendar proper, while the upper portion, with the exception of the first leaf, contains an illustration of one of the processes through which the raw materials pass and the care exercised in their inspection or testing at every step from the ore to the finished product. The first leaf contains a bird's-eye view of the plant and statistics about the amount of raw material consumed and the output. Copies of the calendar will be sent on receipt of 7 cents for postage.

Saw Grinding Machine.—Huther Bros. Saw Mfg. Company, Rochester, N. Y. Folder. Devoted to a grinding machine that has been especially designed for sharpening inserted tooth milling saws. Directions for the operation of the machine, which was illustrated in *THE IRON AGE*, Aug. 26, 1915, are given and the text is supplemented by an engraving of the machine in actual use.

Threading Machinery.—Landis Machine Company, Inc., Waynesboro, Pa. Catalog No. 22. Size, 6 x 9 in.; pages, 78. Describes and illustrates a line of bolt threading and pointing, nut tapping, pipe and nipple threading, pipe threading and cutting and chaser grinding machines and screw cutting die heads. The points of excellence of the die are briefly pointed out followed by a description of the chaser and its holder and

the various die heads, the text being supplemented by both line and halftone engravings and tables of specifications and clearance diagrams. Where a number of machines of the same general type are shown, a brief general description is given followed by engravings and specification tables of the different members of the group. Illustrated lists of parts of the rotary die head and the bolt cutting machine are presented, together with a telegraphic code for ordering and a number of tables of useful information are included.

Lapping Compound.—Burd High Compression Ring Company, Rockford, Ill. Form No. 552. Concerned with a compound for lapping piston rings after the cylinders of internal combustion engines have been in use for some time and have acquired a smooth glass-like surface or when the cylinders have been newly ground. The use of this compound, which is a light abrasive material, introduced into the air intake of the carburetor, is described and directions for its use given.

Projectile Lathe.—General Ordnance Company, Denver, Col. Bulletin No. 15-A. Describes chiefly by illustrations a 22-in. heavy duty single-purpose projectile lathe. A description of the machine is given, emphasis being laid upon the fact that although the lathe was designed for shrapnel and high-explosive shells, it may also be used for other work. The equipment furnished either as a part of the tool or at a slight extra cost is mentioned, and a table of specifications is included.

Power Hammers.—Beaudry & Co., Inc., 141 Milk Street, Boston, Mass. Catalog. Presents a brief statement of the work which the various hammers are designed to do in the way of forging and general manufacturing. This is followed by extended descriptions of the two types of hammer, the text being supplemented by a number of halftone engravings. Mention is made of the motor drive that can be supplied, and a condensed table of specifications for both types of hammers is included.

Contractors' Portable Light.—Alexander Milburn Company, Baltimore, Md. Pamphlet. Illustrates a line of lighting and heating burners using kerosene oil. These are designed for use by contractors, railroads, industrial plants, foundries, shipyards, quarries, etc., and can be used as a heating burner in connection with oxy-acetylene welding, shipbuilding and general iron work. The different sizes of burners that are made are shown, together with the carriage that can be furnished where it is desired to move the light from the place readily. A description of the operation of the light supplemented by a line drawing is given and a list of repair parts and accessories is included.

Boring and Turning Mills.—Niles-Bement-Pond Company, 111 Broadway, New York City. Circular. Refers to a new design of motor-driven 62-in. boring and turning mill which was illustrated in *THE IRON AGE*, Aug. 26, 1915. A concise description of the machine and its various features is presented, the several paragraphs describing the latter being emphasized by the use of side heads set in different type. A table of specifications of the other sizes of machine of this type that can be supplied is included.

Repairing Scored Cylinders.—Wilkes-Barre Welding Company, 6 West Ross Street, Wilkes-Barre, Pa. Circular. Pertains to a process of filling in scores in cylinders with a special composition, which is claimed to force its way into the pores of the iron and become a part of the cylinder. The heat applied is not sufficient to warp the cylinder walls and consequently the reboring or grinding is eliminated and the buying of new piston rings avoided. Illustrations of cylinders repaired by this process before and after the work was done are included.

Lifting Magnets and Magnetic Separator.—Cutler-Hammer Clutch Company, Milwaukee, Wis. Two bulletins. The first, No. 12, describes a line of lifting magnets and contains information concerning the design and application of the magnet and the cost of handling various materials. The text is supplemented by over forty illustrations showing installations and features of construction and a table giving the increase in lifting capacity of a new line of magnets that has been developed is included. The other bulletin, No. 26, describes briefly a magnetic separator pulley designed to protect crushing or pulverizing machinery by the removal of stray pieces of iron or steel and also to remove small particles that detract from the purity or quality of the product.

Universal Welding Table.—Cave Welding Company, Springfield, Mass. Circular. Calls attention to a universal table, which was illustrated in *THE IRON AGE*, Aug. 26, 1915, that is designed for use where it is necessary to strap work to a planed surface and bring any part of it to the top without releasing the clamps, as is frequently necessary in automatic welding. A brief description of the construction and operation of the table is presented, supplemented by an engraving giving an idea of some of the possibilities of adjustment.

